OPERATING INSTRUCTIONS

FWE200DH
Dust Concentration Measuring Device

Description
Installation
Operation

SICK
Sensor Intelligence.

Document Information

Described Product
Product name: FWE200DH

Document ID
Title: Operating Instructions FWE200DH
Part No.: 8016686
Version: 1.0
Release: 2014-05

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Warning Symbols

Hazard (general)

Hazard by voltage

Hazard through laser beam

Warning Levels / Signal Words

DANGER
Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING
Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols

Important technical information for this product

Supplementary information

Link to information at another place

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FWE200DH

1 Important information

Main safety information
Intended use
Responsibility of user

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1.1 Main safety information

1.1.1 Hazard through hot and/or aggressive gases

WARNING: Danger from exhaust gas

Hot and/or aggressive gases can escape on gas-carrying system components (sample gas probe, gas hoses, thermo cyclone, measuring unit, ejector) and cause severe injuries to unprotected users.

- ► Switch the measuring system off before starting any work.
- ► Always use suitable protection equipment (protective clothing, protective mask) when working.
- ► Let gas-carrying and hot system components cool down sufficiently before touching or use protective equipment.
- ► Only remove or install the sample gas probe on equipment with gases detrimental to health, high temperatures or high pressure when the equipment is at a standstill.

On equipment with low hazard potential (no danger to health, ambient pressure, low temperatures), the sample gas probe can be installed or removed while the equipment is in operation providing the valid regulations and safety regulations of the equipment are observed, and necessary and suitable protective measures are taken.

1.1.2 Hazard through electrical equipment

WARNING: Danger through power voltage

The FWE200DH measuring system is operational equipment for use in industrial installations.

- ► Switch any live parts with a risk of electric shock disconnected from the mains and potential-free first before starting the work.
- ► Refit any contact protection previously removed before switching the main supply voltage back on again.

1.1.3 Hazards through laser beam

WARNING: Hazards through laser beam

The sender/receiver unit of the FWE200DH uses a laser with protection class 2.

- ⊗ Never look directly into the beam path
- ⊗ Do not point the laser beam at persons
- ⊗ Do not move any reflecting objects into the beam path.

1.1.4 Hazard through moving parts

WARNING: Hazard through moving parts

The optional backpurge unit has a ball valve actuated electrically that can cause severe bruising when not used properly.

- ⊗ Do not insert any body parts (fingers) or objects into the openings during actuation.

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1.2 Intended use

Purpose of the device

The FWE200DH only serves continuous measurement of dust concentrations in wet gases.

Correct use

- ► Use the device only as described in these Operating Instructions. The manufacturer bears no responsibility for any other use.
- ► Observe all measures necessary for conservation of value, e.g., for maintenance and inspection and/or transport and storage.
- ⊗ Do not remove, add or modify any components on or in the device unless described and specified in the official manufacturer information. Otherwise
  - the device could become dangerous
  - the manufacturer's warranty becomes void

Restrictions of use

The FWE200DH measuring system is not approved for use in potentially explosive atmospheres.

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1.3 Responsibility of user

- ► Only put the FWE200DH into operation after reading the Operating Instructions.
- ► Observe all safety information.
- ► If anything is not clear: Please contact SICK Customer Service.

Designated users

All operators of the FWE200DH should be specifically trained on this device, knowledgable of relevant regulations, and able to assess potential hazards related to its operation.

Equipment safety

The safety of a system in which the FWE200DH is integrated is the responsibility of the person operating the system.

Correct use

- This Manual presumes that the FWE200DH has been delivered as specified during project planning (i.e., based on the SICK application questionnaire) and the relevant delivery state of the FWE200DH (→ delivered System Documentation).
  - ► Contact SICK Customer Service if you are not sure whether the FWE200DH corresponds to the state defined during project planning or to the delivered system documentation.
- ► Use the FWE200DH only as described in these Operating Instructions. The manufacturer bears no responsibility for any other use.
- ► Perform the specified maintenance work.
- ⊗ Do not carry out any work or repairs on the FWE200DH not described in this Manual. Do not remove, add or modify any FWE200DH components unless described or specified in the official manufacturer information.
  Otherwise:
  - – the manufacturer's warranty becomes void
  - – the FWE200DH could become dangerous

Special local conditions

- ► Follow all local laws, regulations and company-internal operating directives applicable at the installation location.

Electric connection

- ► It must be possible to switch the power supply of the FWE200DH off using a power isolating switch/circuit breaker in accordance with EN 61010-1.

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1.4 Safety information and protective measures

Protection devices

NOTICE:
Suitable protection devices and safety equipment for persons must be available according to the respective hazard potential and be used by the personnel.

Preventive measures for operating safety

NOTICE:
The user must ensure that:
- ► Neither failures nor erroneous measurements can lead to operational states that can cause damage or become dangerous
- ► The specified maintenance and inspection tasks are carried out regularly by qualified, experienced personnel.

Recognizing malfunctions

Every deviation from normal operation is to be regarded as a serious indication of a functional impairment. These are, amongst others:

- Warning displays (e.g., heavy contamination)
- Significant drifts in measured results
- Power input above the rated value of the device
- System component temperatures above normal operating values or the fixed limit values
- Monitoring devices triggering
- Smells or smoke emission

Avoiding damage

NOTICE:
The operator must ensure the following to avoid malfunctions that can indirectly or directly lead to injuries to persons or material damage:
- ► The FWE200DH is connected to a safe (uninterrupted) power supply,
- ► The responsible maintenance personnel are present at any time and as fast as possible
- ► The maintenance personnel are adequately qualified to react correctly to malfunctions of the measuring system and any resulting operational interruptions (e.g., when used for measurement and control purposes)
- ► The defective equipment is switched off immediately in case of doubt
- ► Switching off the equipment does not indirectly cause further malfunctions
- ► When the equipment is at a standstill, the FWE200DH is either operated furthermore or put out of operation → p. 121, §5.3).

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FWE200DH

2 Product Description

System features and application areas
FWE200DH operating principle
Device components

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2.1 System features and application areas

The FWE200DH measuring system serves continuous measurement of dust concentrations up to 200 mg/m³ (typical application area) in wet gases (temperature below dew point) with a resolution to approx. 0.1 mg/m³. It can be used in a wide range of applications and features low installation effort and simple handling.

2.1.1 System features and advantages

- Extraction of a partial gas flow from the gas duct
- Drying and overheating the wet partial gas flow with adjustable electrical heating for constant sample gas temperature to rule out measurement errors caused by droplets existing before
- Gas extraction and return with one sample gas probe which means only one mounting flange is required
- Dust content determination using scattered light measurement for low to medium dust concentrations
- Compact measuring system design means simple assembly and installation
- Operating values and system status displayed on an LC-Display
- Flow monitoring with integrated differential pressure measurement
- Simple configuration and operation using user-friendly software
- Self-control through automatic function check (→ p. 19, §2.2.5)

2.1.2 Application areas

- Measuring dust emissions in power stations downstream from flue gas desulferization plants
- Measuring dust in wet purifiers and waste incineration plants
- Measuring dust content in wet exhaust air from technological processes

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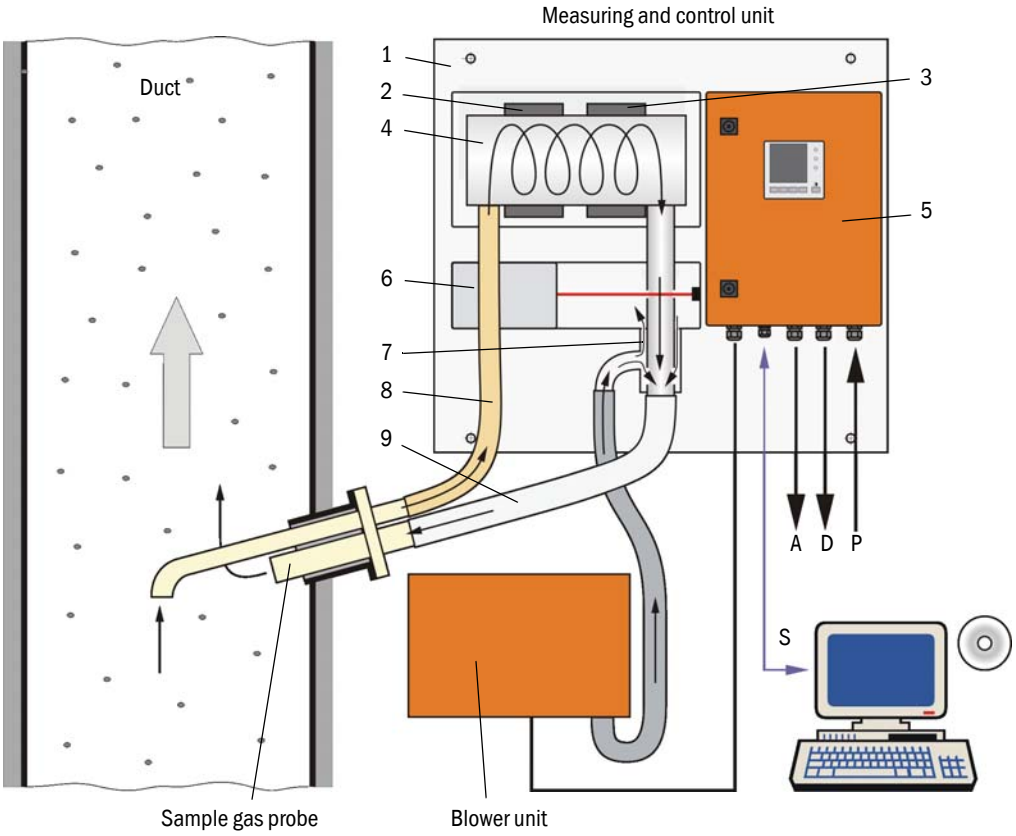
2.2 FWE200DH operating principle

2.2.1 Functional principle

The FWE200DH functions as a bypass system. A partial gas flow is extracted from the flue gas duct via a sample gas probe, overheated in a thermo cyclone to vaporize water drops and aerosols and fed to a measuring cell. The sample gas is exposed to a laser beam in the measuring cell and the scattered light on the particles in the gas flow measured by a receiver. The measured scattered light intensity serves as basis for determining the dust concentration. The sample gas is then fed back to the sample gas probe again to be returned to the duct.

An ejector with a blower creates the gas flow through the measuring system. A partial flow in the measuring cell serves for cleaning and cooling the optical components.

Fig 1 FWE200DH basic layout



1 Base plate
2 Heating band 1
3 Heating band 2
4 Thermo cyclone
5 Control unit
6 Measuring sensor with measuring cell
7 Ejector
8 Extraction line
9 Return line

S SOPAS ET operating software
P Power supply 115 / 230 V AC
A Output signal 0 ... 20 mA
D Status signals

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2.2.2 Isokinetic behavior

Due to the specific design, the measuring behavior of the FWE200DH does not depend on changes of the gas velocity in the duct in a wide range. Therefore an isokinetic extraction (extraction velocity = gas velocity) is not required. It is merely necessary to select the extraction aperture of the sample gas probe depending on the average velocity (v_{rated}) from the following Table. In addition, the blower speed (→ p. 30, §2.3.5) is set during startup so that the flow rate is within the ideal range. This ensures reliable operation even with changing gas velocities.

The following effects can occur when the flow rate is not adapted to the equipment conditions:

- Flow rate too low
  → particles can be deposited in the gas-carrying parts.
- Flow rate too high, gas/ambient temperature very low, gas wetness very high
  → the set sample gas temperature is not reached → aerosols/water droplets do not vaporize completely (heating output of thermo cyclone is limited).

Sample gas probe extraction aperture	Gas velocity in the duct in m/s		
Nominal diameter	v_{min}	v_{rated}	v_{max}
DN23	7	8.5	10
DN18	10	15	20
DN14	20	25	30

If v_{rated} is not known when ordering (e.g., no specification in the Technical questionnaire), the sample gas probe is delivered with standard value DN 18.

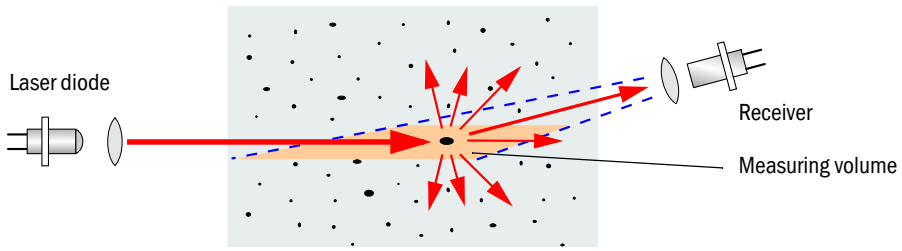
2.2.3 Scattered light measuring principle

The FWE200DH works according to the scattered light measurement principle (forward dispersion). The high sensitivity of this principle makes it particularly suitable for measuring low particle concentrations.

A laser diode beams the dust particles in the sample gas flow with modulated light in the visual range (wavelength approx. 650 nm). The light scattered by the particles is recorded by a highly sensitive measurement receiver, amplified electrically and processed by a microprocessor in the measuring sensor (“DHSP200”) electronics. The measuring volume in the gas duct is defined through the intersection of the sender beam sent and the receive aperture.

Continuous monitoring of the sender output registers the smallest changes in brightness of the light beam sent which then serve to determine the measurement signal.

Fig 2 Measuring principle



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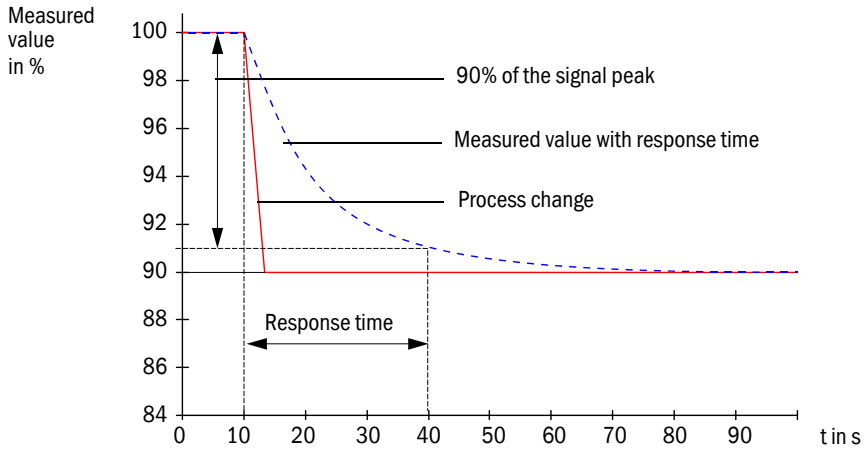
Determining the dust concentration

The measured scattered light intensity SI is proportional to dust concentration c. Since the scattered light intensity not only depends on the number and size of particles but also on their optical characteristics, the measuring system must be calibrated with a gravimetric comparison measurement to ensure exact measuring of the dust concentration. The calibration coefficients determined can be entered directly in the measuring system (available calibration functions → p. 29, §2.3.4.4, standard factory settings → p. 69, §4.3.1, input → p. 80, §4.3.9).

2.2.4 Response time

The response time is the time required to attain 90% of the signal peak after a sudden change in the measurement signal. It can be set anywhere between 1 and 600 s. As the response time increases, transient measured value fluctuations and interruptions are damped stronger and stronger which “smoothes out” the output signal.

Fig 3 Response time



2.2.5 Automatic function check

A function check can be started at fixed intervals as from a definable starting timepoint for an automatic function control of the measuring system. The setting is made using SOPAS ET (→ p. 73, §4.3.4). Any unallowed deviations from normal behavior that may occur are signaled as errors. A function check triggered manually can help localize possible error causes should a device malfunction occur.

Further information → Service Manual

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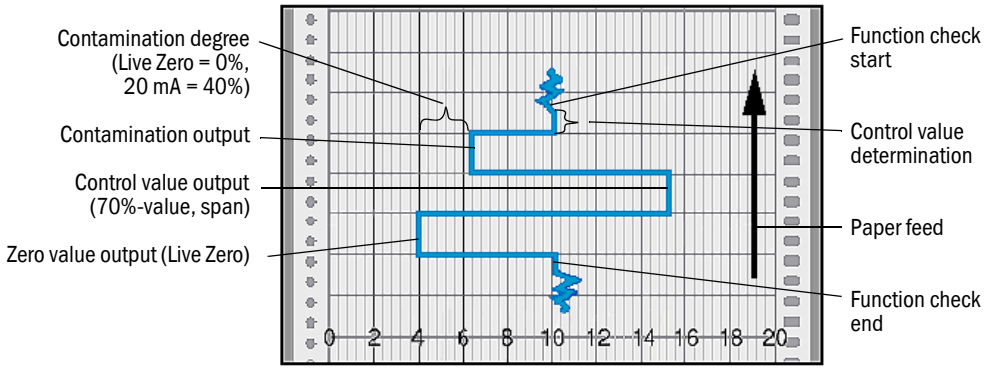
The function check comprises:

- Approx. 30 s measurement of zero value, control value and contamination of the optical surfaces
- Every 90 s (standard value), output of values determined (duration parameter can be modified → p. 73, §4.3.4).

Fig 4 Function check output on a plotter



- The analog output must be activated to output control values on the analog output (→ p. 73, §4.3.4).
- The last value measured is output on the analog output during control value determination.
- If the control values are not output on the analog output, the current measured value is output when control value determination has completed.
- Relay 3 is switched on during a function check (→ p. 42, §3.3.2.1). The single phases of the function check can be output separately via further digital outputs (→ p. 29, §2.3.4.4).
- A function check is not started automatically when the measuring system is in “Maintenance” mode.
- “Function control” is displayed on the LC-Display of the control unit during the function check.
- If the start timepoint or cycle interval are changed, a function check timed between parameter setting and new start timepoint is still carried out.
- Changes to the interval time are first effective after the next start timepoint.

Zero value measurement

The sender diode is switched off for zero point control so that no signal is received. This means possible drifts or zero point deviations are detected reliably in the overall system (e.g., due to an electronic defect). An error signal is generated when the “zero value” is outside the specified range.

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Control value measurement (span test)

Sender beam intensity changes between 70 and 100% during control value determination. The light intensity received is compared against the standard value (70%). The measuring system generates an error signal for deviations greater than ±2%. The error message is cleared again when the next function check runs successfully. The control value is determined with high precision through statistical evaluation of a high number of intensity changes.

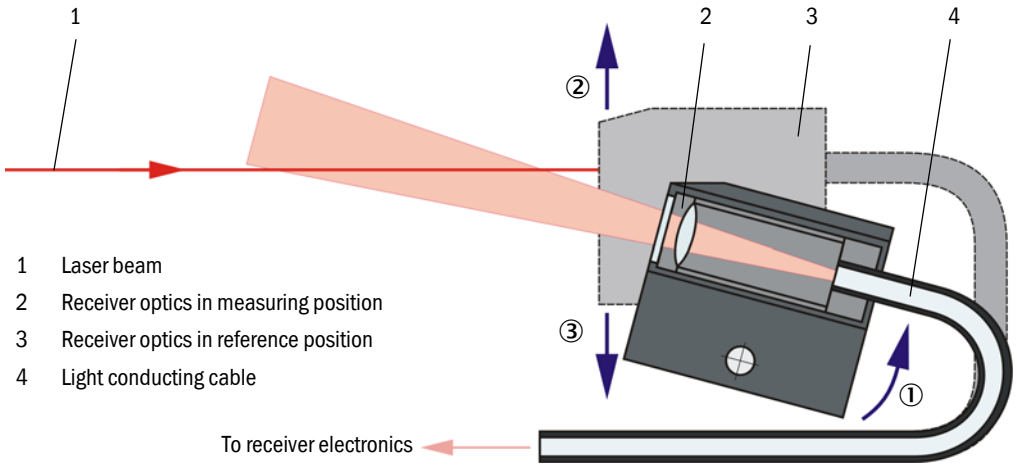
Contamination measurement

To measure contamination, the receiver optics (→ p. 25, Fig. 10) are moved through the laser beam and the scattered light measured at the same time. The measured value determined and the value defined as factory setting are used to calculate a correction factor. This fully compensates any contamination that occurs.

For contamination values < 40 %, a value between Live Zero and 20 mA proportional to the contamination is output on the analog output

A warning message is output for values > 30 % and a “malfunction” output for values as from 40 % (the fault current set on the analog output for this case; → p. 69, §4.3.1, → p. 74, §4.3.5).

Fig 5 Contamination and control value measurement



1 Laser beam
2 Receiver optics in measuring position
3 Receiver optics in reference position
4 Light conducting cable

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2.3 Device components

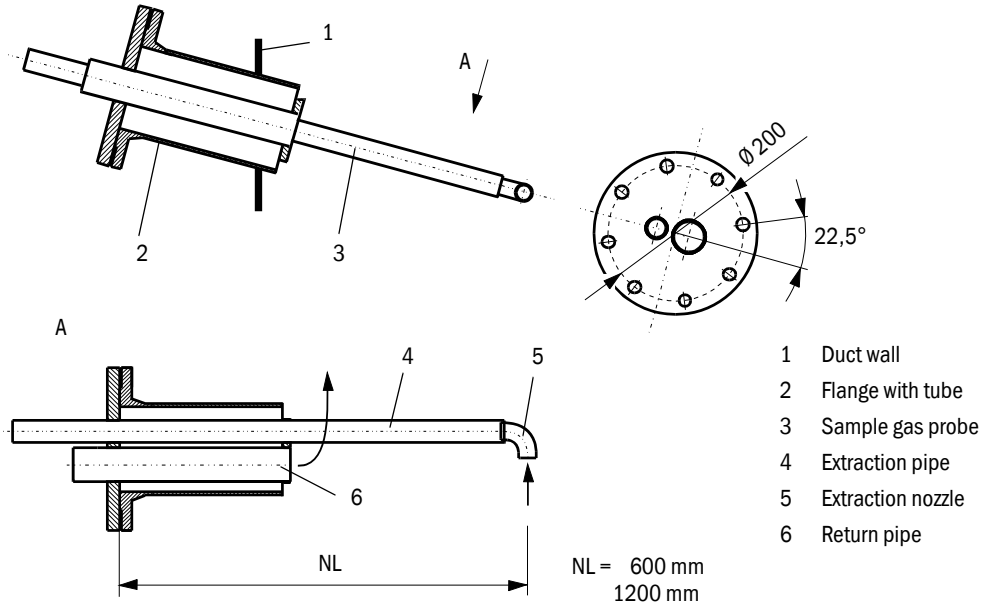
2.3.1 Sample gas probe

The sample gas probe serves to extract and return the partial gas flow, It is fixed on a flange with tube (→ Fig. 7) to be fitted onsite on the gas duct.

The probes are available as standard in two nominal lengths (NL) and materials PVDF (for gas temperatures < 120 °C) and Hastelloy.

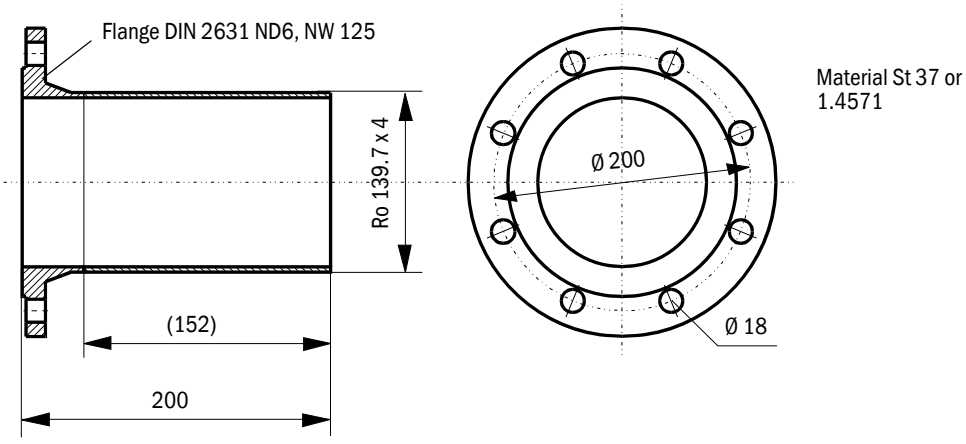
Exchangeable extraction nozzles with nominal diameters DN 14, DN 18 and DN 23 are supplied for adapting the flow rate (→ p. 18, §2.2.2).

Fig 6 Sample gas probe



2.3.2 Flange with tube

Fig 7 Flange with tube



If required, the flange with tube can also be supplied with other dimensions and materials.

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2.3.3 Extraction and return hoses

Sample gas probe and control unit are connected with flexible hoses with NW32 for gas extraction and NW 50 for gas return. Standard length is approx. 1.2 m, heating is not required in most cases (deliverable as option). Longer hoses have a higher maintenance effort (clearing deposits / caking) and cause higher cooling of the extracted partial gas flow as well as pressure loss, and are therefore only usable in exceptional cases after checking the operating conditions.

2.3.4 Measuring and control unit

The measuring and control unit comprises the following components, mounted on a base plate (7).

- Thermo cyclone (1) for overheating the sample gas with temperature sensor (2) to regulate the sample gas temperature
- Measuring sensor (3) with sender and receiver electronics, and measuring cell to transport the partial gas flow through the optical measuring volume of the sender beam
- Ejector (4) to feed the partial gas flow
- Control unit (5).

Fig 8 Measuring and control unit (without weatherproof cover, with backpurge option and cover at the bottom)

6 Adapter for extraction hose (standard)/ to connect the backpurge unit option
8 Hinge for weatherproof cover
9 Backpurge unit option
10 Pressure monitoring
11 Extraction hose
12 Return hose
13 Cover at the bottom

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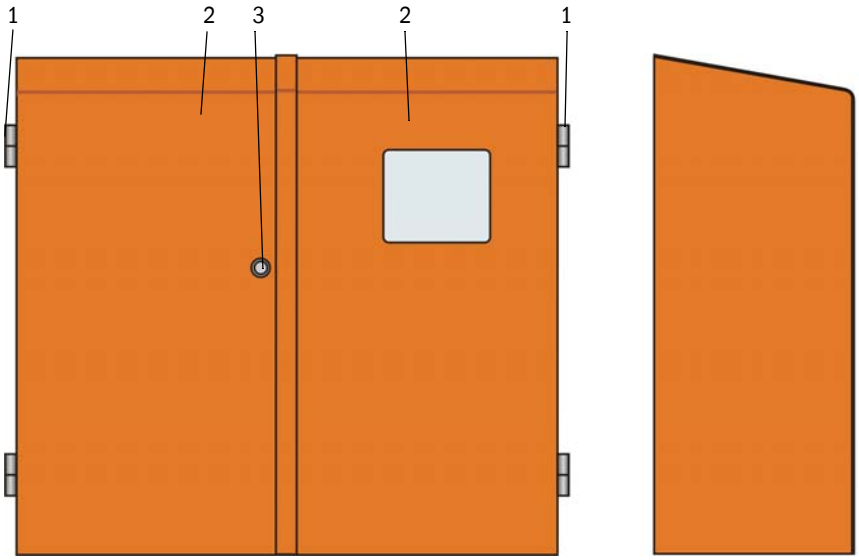
Sample gas flow is monitored with a differential pressure sensor between the thermo cyclone outlet and measuring cell inlet.

The application-dependent equipment and device parameters can be set using SOPAS ET (→ p. 68, §4.3 ff). Three independent software modules are available depending on the function ("FWE200DH" for system functions, "DH SP200" for measuring functions and "MCU" for input/output functions; → p. 66, §4.2.3.5). The parameters are stored reliably even in the case of a power failure.

When in operation, the measuring and control unit is covered by a two-piece hood that serves as weather protection at the same time for outdoor installations. Both parts (2) are hung on hinges (1) on the base plate, can be swiveled away sideways and locked together with lock (3).

Fig 9 Weatherproof cover for FWE200DH



Type code

A type plate identifies the respective version of the measuring and control unit:

Parameter	Version	Type code			
		FWE200DH-	X	X	X
Backpurge unit option	Without		N		
	With		B		
Heated extraction hose option	Without			N	
	With			H	
Optional Interface module	Modbus TCP				J
	Ethernet type 1				E
	Profibus DP				P

Subject to change without notice

2.3.4.1 Thermo cyclone

The thermo cyclone comprises a housing with insulation, a swirl chamber with inlet and outlet connections and 2 heating bands to overheat the partial gas flow. The inlet connection is arranged tangential which creates a swirl flow in the swirl chamber. A PTFE nozzle in the inlet connection accelerates the flow. The swirl chamber can be accessed easily for inspection and possible cleaning after opening a cover.

Temperature sensors attached to the heating bands measure the temperatures which are monitored by the microprocessor control in the control unit. Additional built-in temperature fuses switch the heating bands off at temperatures above approx. 425 °C. This effectively prevents damage to the thermo cyclone through overheating even during a possible electronics failure.

A temperature sensor is fitted on the thermo cyclone outlet and serves as encoder for regulating the sample gas temperature.

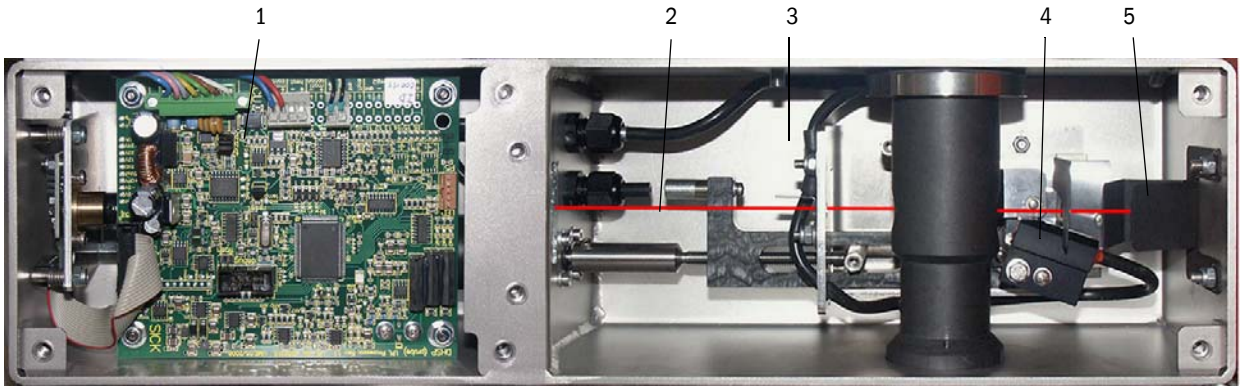
2.3.4.2 Measuring sensor

The measuring sensor comprises two modules installed in one stainless steel housing (p. 25, Fig. 10):

- Electronics unit (1) with the optical and electronic subassemblies to send and receive laser beam (2) as well as signal processing and evaluation.
- Measuring cell (3) with receiver optics (4), light trap (5) and nozzle to transport the sample gas flow.

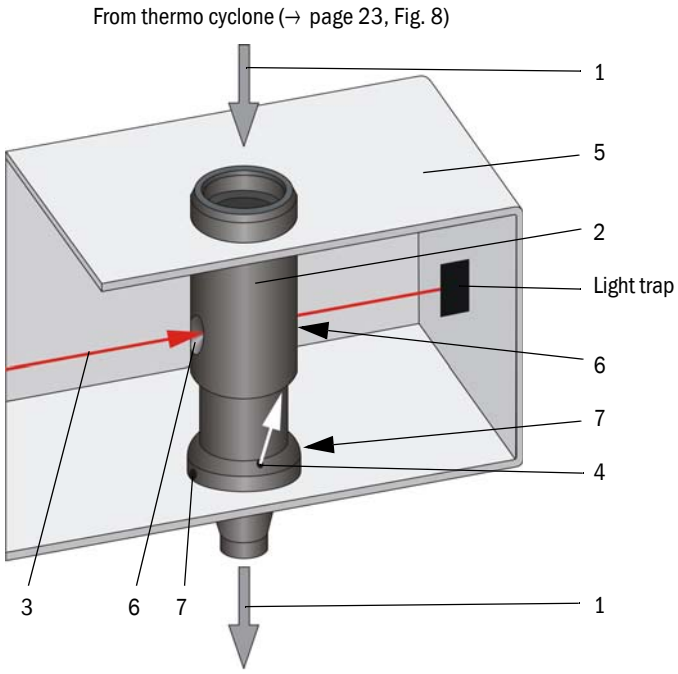
The electronic unit is connected to the control unit with a connection cable for signal transmission and voltage supply (24 V DC).

Fig 10 Measuring sensor open



Subject to change without notice

Fig 11 Sample gas and purge air feed



Sample gas (1) from the thermo cyclone flows down through measuring tube (2) vertically through laser beam (3). The active measuring volume is within the measuring tube so that particles of the sample gas flowing through are recorded by the laser beam. The scattered light signal measured by the receiver therefore represents the dust content in the partial gas flow.

Clean air is blown into measuring cell (3) through small opening (4) in the measuring tube and then transported further via measuring openings (6) with the sample gas. The purge air amount is very low in relation to the sample gas flow so that no mixing with the measuring volume occurs and the purge air has no effect on measuring behavior.

Condensate that may occur due to condensation effects can flow out through 2 openings (7) in the nozzle in the sample gas flow (is drawn away by the partial vacuum).

Subject to change without notice

2.3.4.3 **Control unit**

The control unit has the following functions:

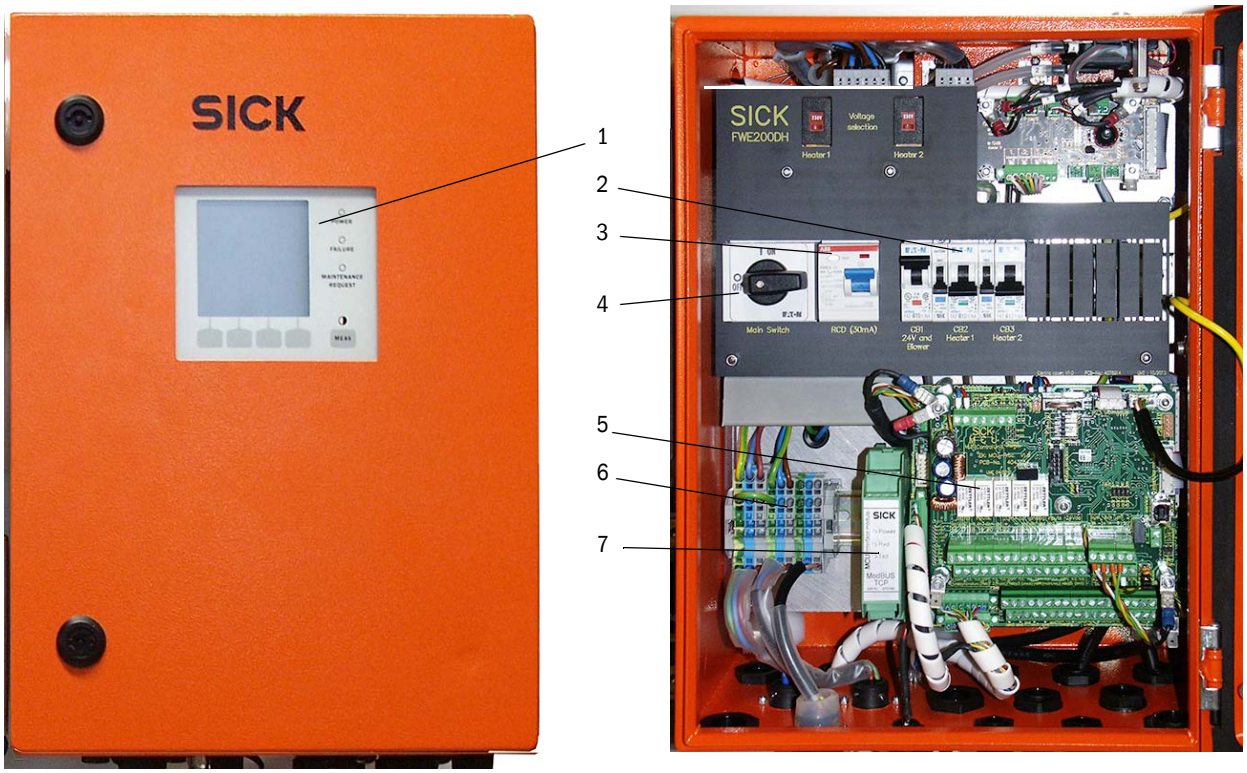
- Starting and stopping the FWE200DH
- Temperature control and monitoring for thermo cyclone heating
- Sample gas flow control
- Monitoring and controlling gas feed (switching blower unit on/off)
- Recording and evaluating status signals
- Controlling data traffic and processing data of the measuring sensor connected via the RS485 interface and system control
- Signal output via analog output (measured value) and relay outputs (device status)
- Signal input via analog and digital inputs
- Power supply for the connected measuring sensor via 24 V switch-mode power supply with wide range input
- Communication with higher level control systems via optional modules

Apart from the control electronics, the control unit also contains the connection elements for thermo cyclone, measuring sensor and blower unit, as well as for analog and status signals.

Measured values and status messages are output on an LC-Display. It also allows configuring basic functions.

The control unit has a sheet steel housing as standard.

Fig 12 Control unit



1 Display module
2 Fuses
3 FI circuit breaker
4 Main switch
5 Processor boards for system control (“FWE200DH”) and data recording/processing and signal input/output (“MCU”)
6 Terminal block for power supply
7 Interface module

Subject to change without notice

Standard interfaces

- Analog outputs

  3 outputs 0/2/4...22 mA (electrically isolated, active, resolution 10 bits) to output scattered light intensity (corresponds to uncalibrated dust concentration), calibrated dust concentration and scaled dust concentration
- Analog inputs

  6 inputs 0...20 mA (without electric isolation, resolution 10 bits) to connect external sensors for measuring gas temperature, gas pressure, gas wetness and O_2 content for calculating scaled dust concentration values
- Relay outputs

  9 changeover contacts 48 V, 1 A to output status signals operation/malfunction, maintenance, function check, maintenance request, limit value
- Digital inputs

  8 inputs to connect potential-free contacts for starting the function check, setting maintenance mode, purge air monitoring, triggering backpurging (when installed → p. 30, §2.3.6.1) and activating the second calibration function (option, → p. 31, §2.3.6.3)
- Communication
  - USB 1.1 and RS232 (on terminals) for measured value inquiries, setting parameters and software updates.
  - Interface module Modbus TCP for communication with higher-level control system

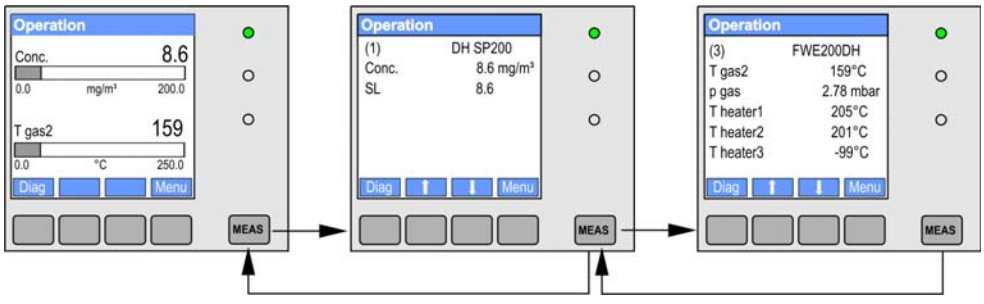
LC-Display

Functions

- Display measured values and status information

Type		Display
LED	Power (green)	Power supply OK
	Failure (red)	Function fault
	Maintenance request (yellow)	Maintenance request
LC-Display	Graphic display (main screen)	2 measured values as bars (e.g., dust concentration or scattered light intensity and sample gas temperature or differential pressure), selection as shown on p. 107, §4.6.4
	Text display	8 diagnosis values (→ p. 104, Fig. 84)

Fig 13 LC-Display with graphic (left) and text display (center and right) (example)



Subject to change without notice

- Control buttons for basic configuration

Button	Function
Meas	• Toggle between text and graphic display • Display the contrast setting (after 2.5 s)
Arrows	Select next/previous measured value page
Diag	Display alarm or error messages
Menu	Display main menu and selection of submenus

After the measuring system has been switched on, the start phase of the FWE200DH is shown on the LC-Display during the warming up time (→ p. 53, §4.1.2).

2.3.4.4 **Extended calibration function**

The following regression functions to calibrate dust concentration measurement are implemented in the FWE200DH as standard (→ p. 18, §2.2.3, → p. 80, §4.3.9):

- Polynomial $c = cc2 \bullet SL^2 + cc1 \bullet SL + cc0$
- Exponential $c = cc2 \bullet e^{(cc1 \bullet SL)} + cc0$
- Logarithmic $c = cc2 \bullet Ln(cc1 \bullet SL) + cc0$
- Power $c = cc2 \bullet SL^{cc1} + cc0$

Two can be used independent of each other (selection and configuration → p. 80, §4.3.9).

Digital input DI5 can be used to toggle between the two calibration functions selected. Apart from that, single values can be output during the function check (→ p. 19, §2.2.5).

Digital input	Function
DI5	Toggle between calibration function 1 and calibration function 2
DI6	Output the last contamination value determined on the analog output
DI7	Output the last control value determined on the analog output
DI8	Output the last zero value determined on the analog output

Relay output	Function
6	Status signal for output of last contamination value
7	Status signal for output of last control value
8	Status signal for output of last zero value
9	Not used

Optional Interface module

The standard built-in Modbus TCP module can be swapped for an Interface module for Profibus DP V0 or Ethernet (type 1) (→ p. 139, §7.3.6).

The module is installed on a top hat rail and connected to the “MCU” processor board with a corresponding cable.

Profibus DP-V0 to transfer via RS485 according to DIN 19245 Part 3 as well as IEC 61158.

Subject to change without notice

2.3.5 Blower unit

The blower unit serves to feed the sample gas into the measuring and control unit via the ejector. A flexible NW 25 hose serves as connection. The ejector delivers a partial flow into the measuring cell at the same time to keep the optical components clean.

The blower control with frequency converter regulates the motor speed and therefore the blower output for ideal sample gas flow.

Fig 14 Blower unit

1 Blower
2 Hose NW 25
3 Base plate
4 Air filter with integrated preliminary filter
5 Blower control

A weatherproof cover is available for use outdoors (→ p. 139, Fig. 107).

2.3.6 Options

2.3.6.1 Backpurge unit

Subassembly (→ p. 23, Fig. 8) to backpurge the extraction line (hose and sample gas probe) comprising:

- Solenoid valve to connect instrument air
- Ball valve in the sampling line to close off the thermo cyclone during the purge process.

Backpurging is started automatically during the function check. In addition, a purge process can be triggered manually by closing digital input DI4 with an external switch.

The measuring system is in “Maintenance” mode during the purge process. The purge process is displayed on the LC-Display.

This option is released with a codeword when retrofitted later (included in scope of delivery).

On request, the backpurge option can also be delivered for connecting water as purge medium.

Subject to change without notice

2.3.6.2 **Heated extraction hose**

In special single cases (e.g., very low gas temperature and high gas wetness, very low ambient temperatures, limitation of heater temperatures), it can be useful to heat the extraction line as well. The standard extraction hose used can be replaced with a ready-made hose with heating. The measuring and control unit must then be specially adapted (type code → p. 23, §2.3.4).

An additional temperature sensor monitors the gas temperature at the thermo cyclone inlet with this option (Pos. 3 in → p. 23, Fig. 8).

2.3.6.3 **Remote unit**

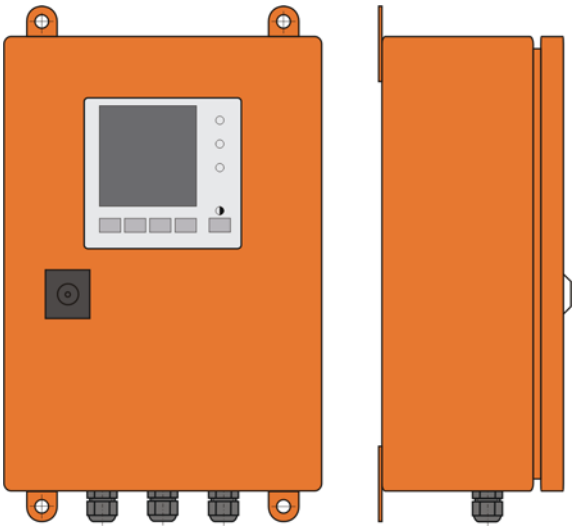
Module with LC-Display to display measured values and status, data inquiry and configuration. A cable to be installed onsite then serves to connect to the system technology (RS485) in the control unit.

Following wire cross-sections are required depending on the distance to the measuring and control unit:

Max. cable length in m	Wire cross-section in mm²
120	0.14
250	0.25
500	0.5
1000	1.0

The remote unit can also be delivered with an optional integrated power supply unit for separate power supply (recommended for longer distances to measuring and control unit).

Fig 15 Remote unit



Subject to change without notice

2.3.6.4 **Cover at the bottom**

This subassembly serves as additional protection of the measuring system at low ambient temperatures. It is installed on the base plate of the measuring and control unit and closes the weatherproof cover at the bottom.

Fig 16 Cover at the bottom

2.3.6.5 **Test equipment for linearity test**

A linearity test can serve to check the correct measurement function (see Service Manual). In this case, filter glasses with defined transmission values are positioned in the beam path and the values compared against those measured by the measuring system. Compliance within the allowed tolerance means the measuring system is working correctly. The filter glasses with holder required for the check are deliverable including a carrying case.

Subject to change without notice

FWE200DH

3 Assembly and Installation

Project planning
Assembly
Installation

Subject to change without notice

3.1 Project planning

The following Table provides an overview of the project planning work necessary as prerequisite for trouble-free assembly and subsequent device functionality. You can use this Table as a Checklist and check off the completed steps.

Task	Requirements		Work step	☑
Determine the measuring and installation location for the device components	Inlet and outlet paths according to DIN EN 13284-1 (inlet at least 5x hydraulic diameter d_h, outlet at least 3x d_h; distance to stack opening at least 5x d_h)	For round and square ducts: d_h = duct diameter For rectangular ducts: d_h = 4x cross-section divided by circumference	– Follow specifications for new equipment – Select best possible location for existing equipment; – For too short inlet/outlet paths: Inlet path > outlet path	☐
	– Uniform flow distribution – Representative dust distribution	Whenever possible, no deflections, cross-section variations, feed and drain lines, flaps or fittings in the area of the inlet and outlet paths	If conditions cannot be ensured, define flow profile according to DIN EN 13284-1 and select best possible location	☐
	Sample gas probe installation position	Installation angle to horizontal 15°; vertical installation from the top possible for horizontal or slanted ducts	Select best possible location	☐
	Accessibility, accident prevention	The device components must be easily and safely accessible	Provide platforms or pedestals as required	☐
	Installation free of vibrations	Acceleration < 1 g	Eliminate/reduce vibrations through suitable measures	☐
	Ambient conditions	Limit values according to Technical Data (→ p. 132, §7.1)	If necessary, enclose device components	☐
	Intake air for blower unit	Whenever possible, low amount of dust, no oil, moisture or corrosive gases	Select best possible location for air intake Determine required purge air hose length	☐
Select device components	Internal duct diameter, insulation, wall thickness	Nominal length and material of sample gas probe	Select suitable components as described in → p. 132, §7.1	☐
	Gas temperature			
	Supply voltage, internal duct pressure	Type of measuring and control unit and blower unit		
Plan calibration openings	Access	Easy and safe	Provide platforms or pedestals as required	☐
	Distances to measuring level	No mutual interference between calibration probe and FWE200DH	Plan sufficient distance between measuring and calibration level (approx. 500 mm)	☐
Plan power supply	Operating voltage, power requirements	According to Technical Data (→ p. 132, §7.1)	Plan adequate cable cross-sections and fuses	☐

NOTICE:

► Consider the weights of these components when planning brackets and strength of fitting locations for measuring and control unit and blower unit.

Subject to change without notice

3.2 Assembly

Carry out all assembly work onsite. This includes:

- Fitting the flange with tube
- Installing the measuring and control unit
- Installing the blower unit

WARNING:

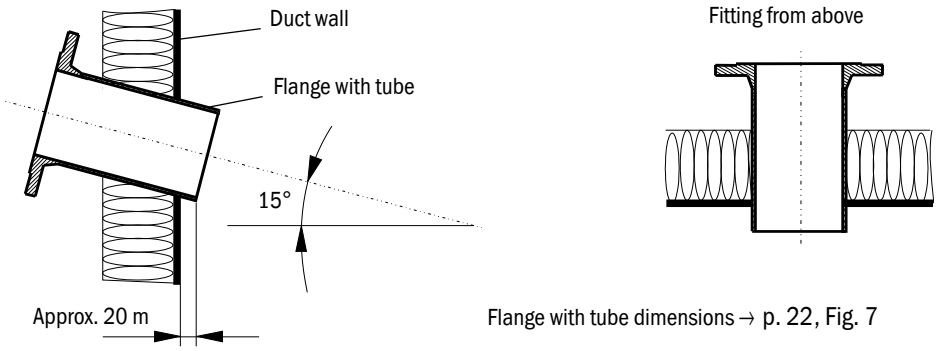
- Observe the relevant safety regulations as well as the safety notices in Section 1 during all assembly work.
- Only carry out assembly work on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.
- Take suitable protection measures against possible local hazards or hazards arising from the equipment.

3.2.1 Fitting the flange with tube

The flange must be fitted so that any condensate occurring can flow back into the duct (→ Fig. 17). Ensure the sample gas probe is aligned as shown in p. 36, Fig. 18.

Vertical fitting from above is also possible for horizontal or slanted ducts.

Fig 17 Fitting the flange with tube

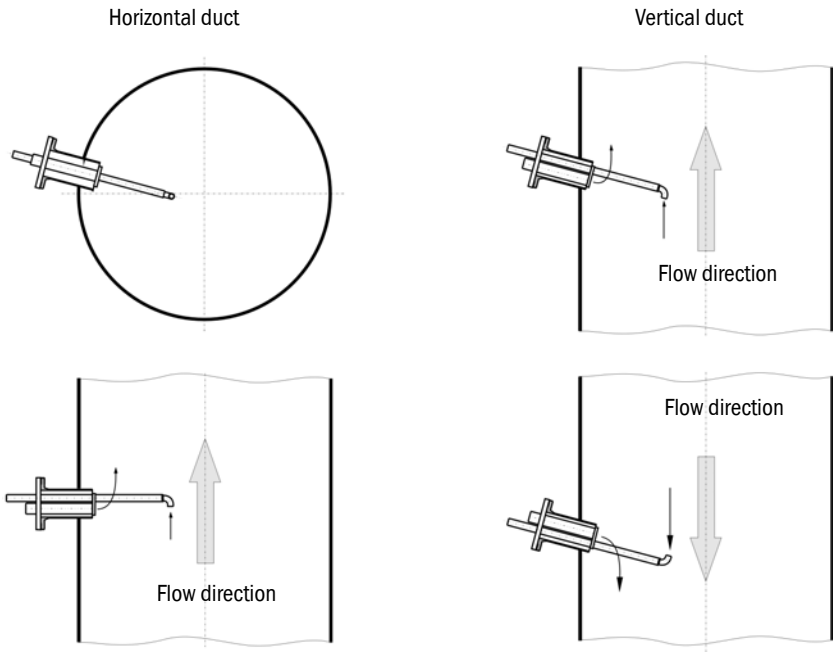


Flange with tube dimensions → p. 22, Fig. 7

If none of the flanges with tube in the scope of delivery (→ p. 134, §7.2.2) should or could be used (e.g., on GRP ducts), these must be provided onsite under consideration of the probe dimensions (→ p. 134, Fig. 101 and → p. 134, Fig. 102).

Subject to change without notice

Fig 18 Sample gas probe alignment



Work to be performed

- ► Measure the fitting location and mark the installation location.
- ► Remove insulation (when fitted)
- ► Cut out suitable aperture in the duct wall; with brick and concrete ducts, drill suitably sized hole (for flange tube diameter → p. 22, Fig. 7).

> ***NOTICE:***
> ⊗ Do not let separated pieces fall into the duct.

- ► Insert the flange with tube in the opening and weld it (steel ducts).

> - For brick or concrete ducts, weld the flange with pipe onto the anchor plate when necessary and fasten it on the duct.
> - Use junction plates as well on ducts with thin walls.

- ► Close off the flange opening after fitting to prevent gas escaping.

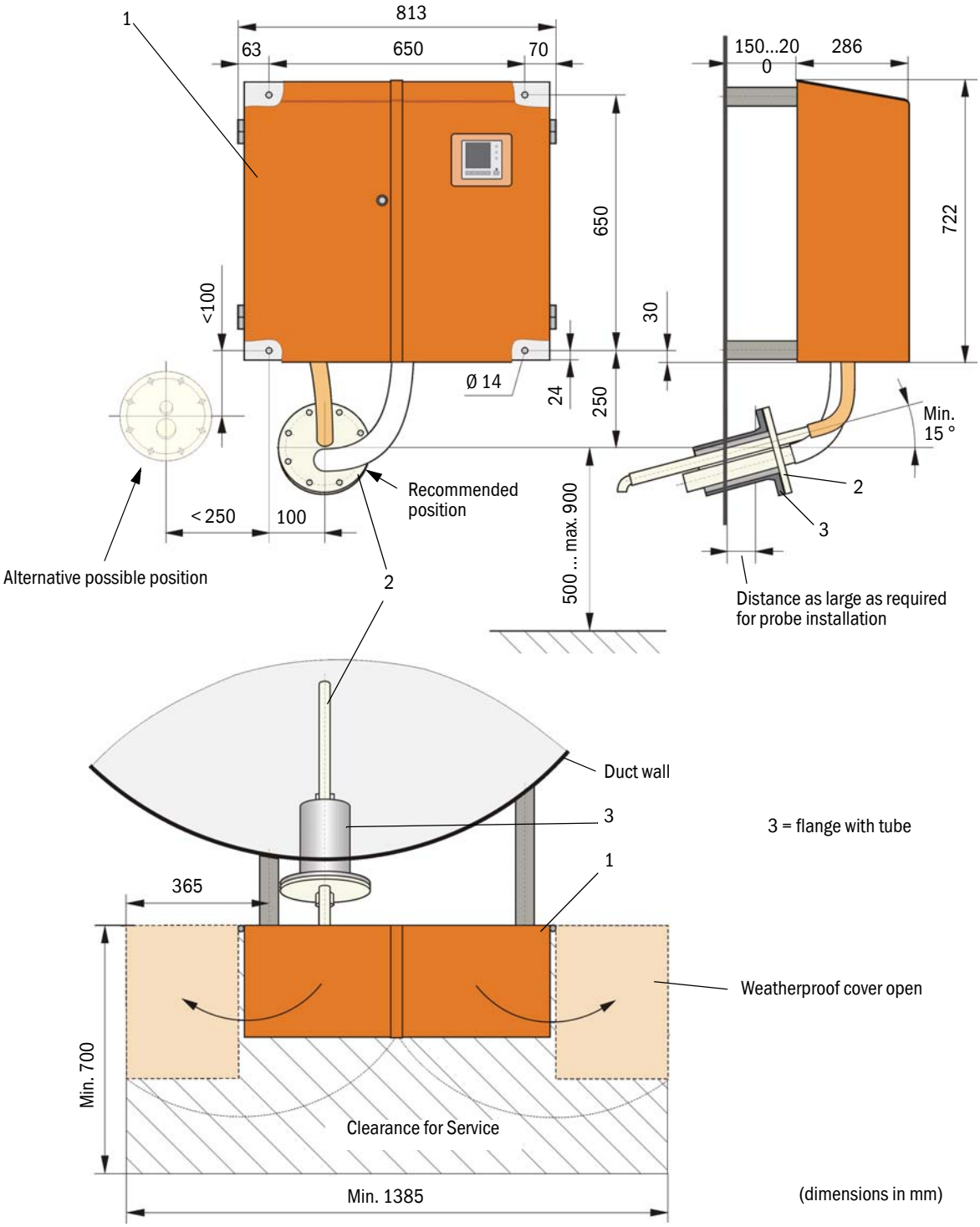
3.2.2 Installing the measuring and control unit

Consider the following points when selecting the installation location:

- Measuring and control unit (1) must be fitted on a level, vertical base at an easily accessible, protected location with dimensions according to Fig. 19.
- Maintain the distances to sample gas probe (2).
- The fitting location must be vibration free.
- Ambient temperatures must be within the permissible range (→ p. 132, §7.1), take possible radiant heat into consideration.
- Suitable hoisting gear and sufficient clearance are required for transporting and fitting the measuring and control unit (weight → p. 132, §7.1).

Subject to change without notice

Fig 19 Assembly dimensions



Work to be performed

- ► Prepare and fit fastening points according to p. 37, Fig. 19.
- ► Fit the measuring and control unit.

The measuring and control unit can also be fitted on an optionally deliverable frame (→ p. 138, Fig. 106)

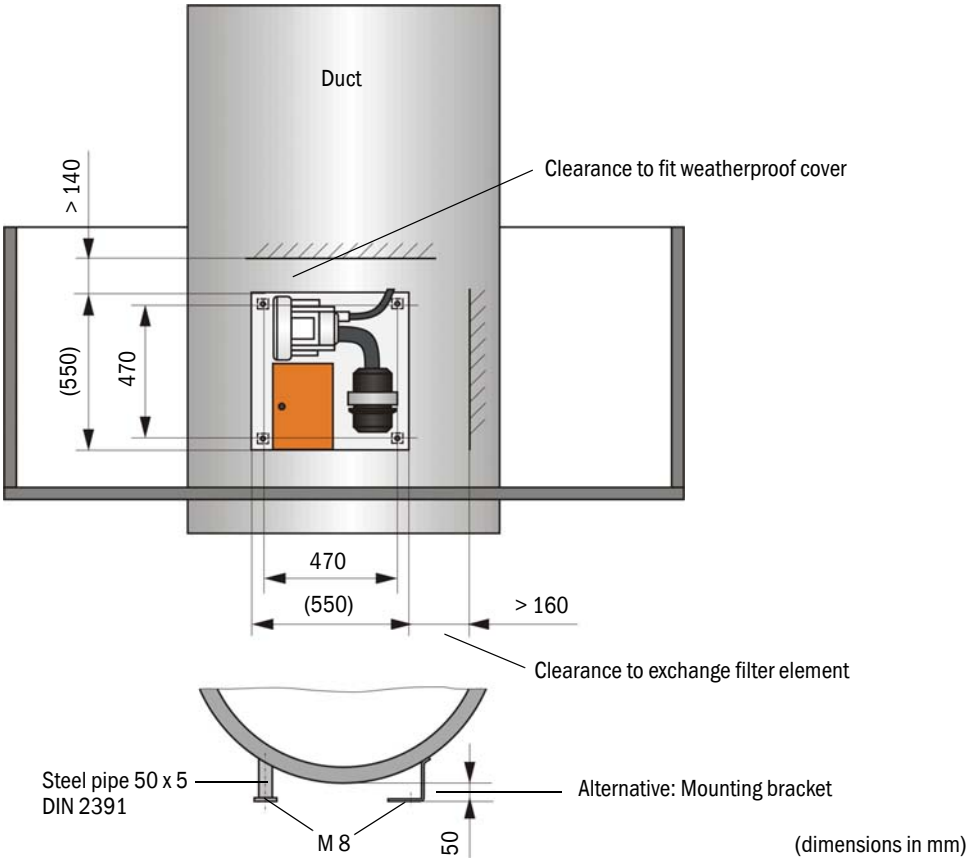
Subject to change without notice

3.2.3 Installing the blower unit

Consider the following points when selecting the installation location:

- A level, vertical base at an easily accessible, protected location with clean air when possible is required.
- The distance to the measuring and control unit must not exceed 10 m. Lay the hose from the ejector to the measuring and control unit running downwards to the blower unit (avoids water collecting).
- The intake temperature must be within the permitted range (→ p. 132, §7.1). In unfavorable conditions, lay an air intake hose or pipe to a location with better conditions.
- Provide sufficient clearance to exchange the filter element and to attach and remove the weatherproof cover when installing outdoors (→ Fig. 20).
- Suitable hoisting gear and sufficient clearance are required for transporting and fitting the blower unit (weight → p. 132, §7.1).

Fig 20 Blower unit layout and assembly dimensions (dimensions in mm)



Assembly work

- ► Prepare holder (→ p. 38, Fig. 20).
- ► Fasten the blower unit with 4 M8 screws.
- ► Check whether the filter element is fitted in the filter housing otherwise fit when necessary.

The blower unit can also be fitted on an optionally deliverable frame (→ p. 138, Fig. 106)

Subject to change without notice

Weatherproof cover for blower unit

The weatherproof cover (→ p. 139, Fig. 107) comprises a cover and locking set.

Installation:

- ► Fit the locking pins from the locking set on the base plate.
- ► Put the weatherproof cover on from above.
- ► Insert the holding catches into the counterpieces from the side, twist and lock in.

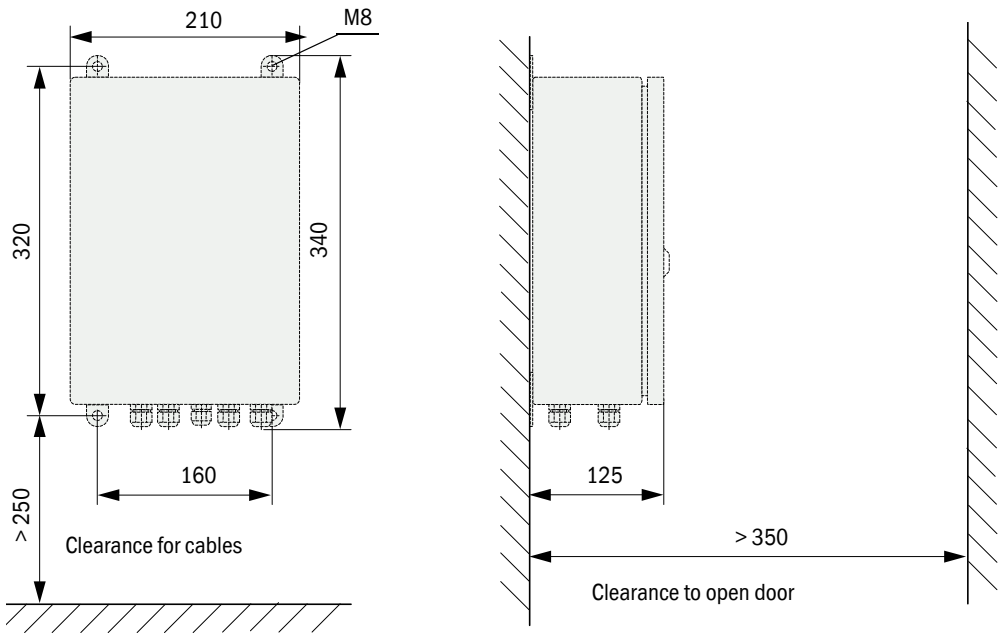
3.2.4 Installing the remote unit option

Install the remote unit in an easily accessible, protected location (→ Fig. 21). Observe the following points during installation:

- Maintain the ambient temperature according to the Technical Data; take possible radiant heat into consideration (shield when necessary).
- Protect against direct sunlight.
- Whenever possible, choose an installation location with minimum vibrations; dampen any vibrations when necessary.
- Leave enough clearance for cables and opening the door.

Assembly dimensions

Fig 21 Remote unit assembly dimensions



(Dimensions in mm)

The remote unit can be fitted up to 1000 m from the measuring and control unit. We therefore recommend fitting the remote unit in a control room (measuring station or similar) to ensure free access. This considerably simplifies communication with the measuring system in order to set parameters or to locate malfunction or error causes.

It is advantageous to provide weather protection (tin roof or similar), to be made onsite, for use outdoors.

Subject to change without notice

3.3 Installation

WARNING:

- ► Observe the relevant safety regulations as well as the safety notices in Section 1 during all installation work.
- ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.

NOTICE:

- ► During installation, it must be possible to switch the power supply to the FWE200DH off using a power isolating switch/circuit breaker in accordance with EN 61010-1.
- ► After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

3.3.1 General information

Prerequisites

The assembly work described in §3.2 must have been carried out before starting installation.

For the power supply to the FWE200DH, a one-phase main supply voltage

– 230 V AC 50/60 Hz with fuse min. 10 A or

– 115 V AC 50/60 Hz with fuse min. 15 A

must be available.

Installation work

Carry out all installation work onsite unless otherwise explicitly agreed with SICK or authorized representatives. This work involves:

- Laying power supply and signal cables.
- Installing switches and mains fuses.
- Connecting the blower unit to the corresponding terminals in the control unit of the measuring and control unit.
- Connecting the cables for analog and status signals as well as digital inputs to the terminals of the I/O board in the control unit.
- Connecting the measuring and control unit to the main supply voltage.

NOTICE:

- ► Only use cables specified for temperatures up to 75 °C (EN 61010-1:2011 5.1.8 Connection Boxes of Field Devices).

  The control unit can reach a temperature > 60 °C due to self-heating at maximum ambient temperature.
- ► Plan adequate line cross-sections (→ p. 132, §7.1).
- ► Before connecting the components, check that the power voltage/ frequency available matches the delivered version of the measuring and control unit and blower unit.

Subject to change without notice

3.3.2 Connecting the control unit

► Check that changeover switches (1) for heater voltage are set to the supply voltage available at the installation location and, if not, set as required.

Fig 22 Switch for supply voltage in the measuring and control unit

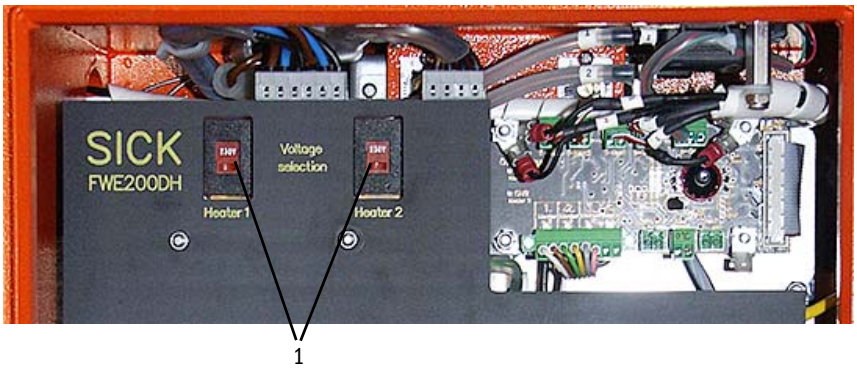
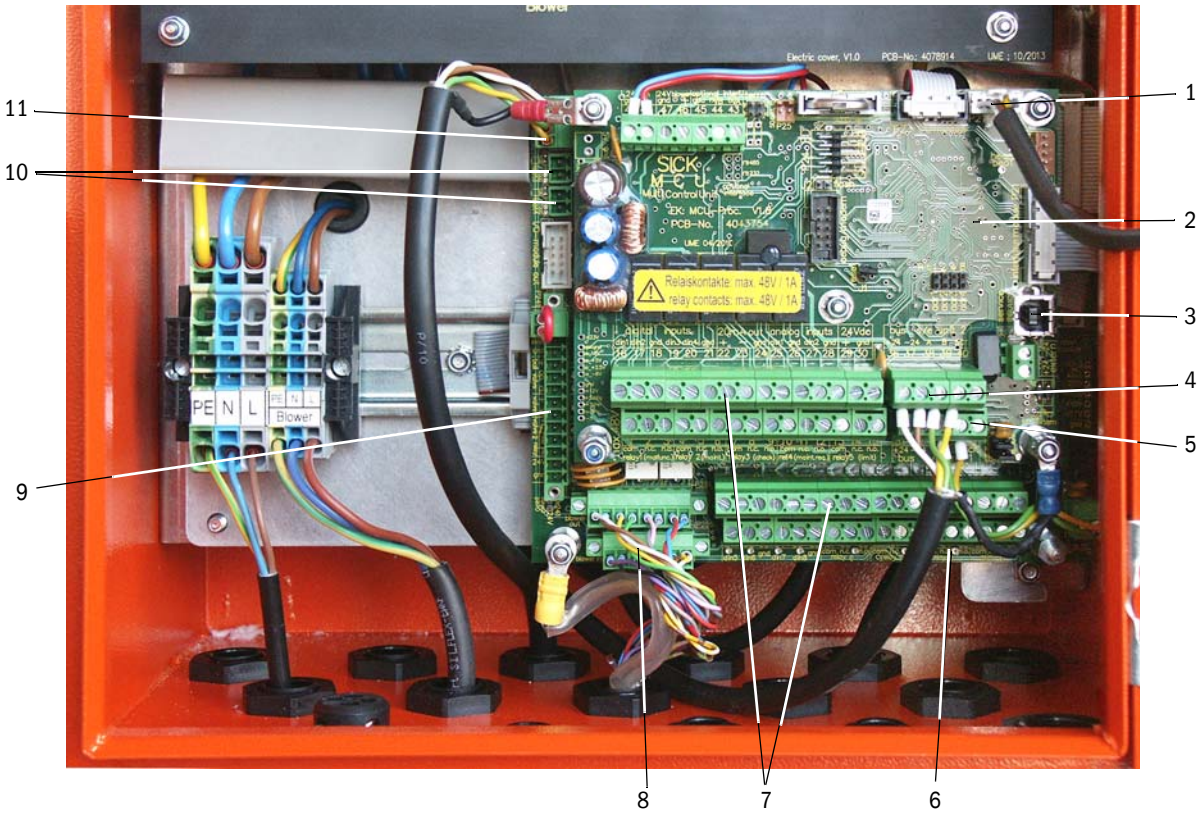


Fig 23 Control unit connections



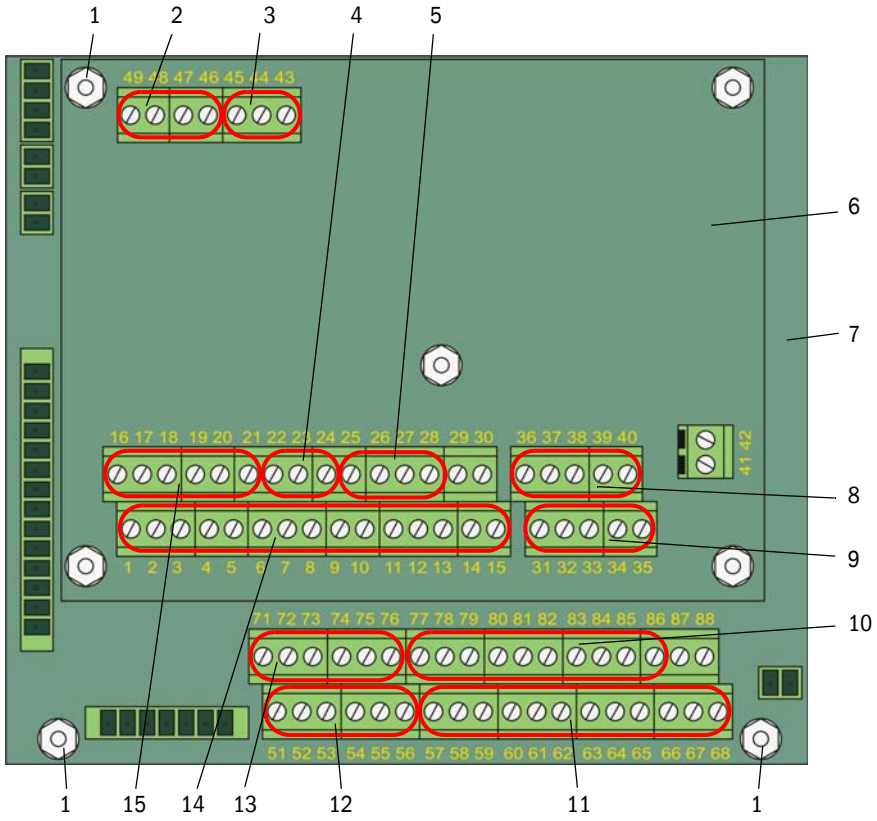
1 Connection for Display module
2 Processor board for data recording/processing and signal input/output (MCU)
3 USB plug connector
4 Connections for measuring sensor (DHSP200)
5 Connections for system control processor board
6 System control processor board (FWE200DH)
7 Connections for signal inputs and outputs
8 Connections for blower control cable
9 Connections for backpurge option
10 Connection for external temperature sensors
11 Connection for remote unit

Subject to change without notice

3.3.2.1 Connecting cables for digital, analog and status signals

► Connect outputs for digital, analog and status signals using suitable cables (e.g., LiYCY 4x2x0.5 mm²) according to Fig. 24 and the following Table.

Fig 24 Connections for processor boards



1 Connection for cable shielding
2 Supply voltage 24 V DC
3 RS232
4 Connection for analog output AO1
5 Connections for analog inputs AI1 and AI2
6 Processor board for data recording/processing and signal input/output (MCU)
7 System control processor board (FWE200DH)
8 Connections for measuring sensor (DHSP200) (connected at the factory)
9 Connections for system control processor board (FWE200DH) (connected at the factory)
10 Connections for analog inputs AI3 to AI6
11 Connections for relays 6 to 9 (with the extended calibration function option installed) → p. 31, §2.3.6.3)
12 Connections for digital inputs D15 to D18 (with the extended calibration function option installed) → p. 31, §2.3.6.3)
13 Connections for analog outputs AO2 and AO3
14 Connections for relays 1 to 5
15 Connections for digital inputs DI1 to DI4

Subject to change without notice

Connections on processor board for data recording/processing and signal input/ output (MCU)

Terminal No.	Connection	Function
1	COM	Output relay 1 (operation/malfunction)
2	n.c.[1)]	
3	n.o.[2)]	
4	COM	Output relay 2 (maintenance)
5	n.c.[1)]	
6	n.o.[2)]	
7	COM	Output relay 3 (function check)
8	n.c.[1)]	
9	n.o.[2)]	
10	COM	Output relay 4 (maintenance request)
11	n.c.[1)]	
12	n.o.[2)]	
13	COM	Output relay 5 (limit value)
14	n.c.[1)]	
15	n.o.[2)]	
16	d in1	Digital input DI1 (start function check)
17	d in2	Digital input DI2 (set maintenance mode)
18	gnd	Ground for DI1 and DI2 (usable as shield connection for signal cable)
19	d in3	Digital input DI3 (purge air monitoring)
20	d in4	Digital input DI4 (triggering backpurge option when installed)
21	gnd	Ground for DI3 and DI4 (usable as shield connection for signal cable)
22	+	Analog output AO1
23	-	
24	gnd	
25	a in1	Analog input AI1
26	gnd	
27	a in2	Analog input AI2
28	gnd	

1): Closed when without current (normal closed)

2): Open when without current (normal open)

Subject to change without notice

Connections on processor board for system control (FWE200DH)

Terminal No.	Connection	Function
51	d in5	Digital input DI5 (calibration function switchover)
52	d in6	Digital input DI6 (output contamination value on AO)
53	gnd	Ground for DI5 and DI6
54	d in7	Digital input DI7 (output control value on AO)
55	d in8	Digital input DI8 (output zero value on AO)
56	gnd	Ground for DI7 and DI8 (usable as shield connection for signal cable)
57	COM	Output relay 6 for output of last contamination value
58	n.c.[1)]	
59	n.o.[2)]	
60	COM	Output relay 7 for output of last control value
61	n.c.[1)]	
62	n.o.[2)]	
63	COM	Output relay 8 for output of last zero value
64	n.c.[1)]	
65	n.o.[2)]	
66	COM	Not used
67	n.c.[1)]	
68	n.o.[2)]	
71	+	Analog output AO2
72	-	
73	gnd	Ground (usable as shield connection for signal cable)
74	+	Analog output AO3
75	-	
76	gnd	Ground (usable as shield connection for signal cable)
77	+	Analog input AI3
78	-	
79	gnd	Ground for AI3 and AI4 (usable as shield connection for signal cable)
80	+	Analog input AI4
81	-	
82	+	Analog input AI5
83	-	
84	gnd	Ground for AI5 and AI6 (usable as shield connection for signal cable)
85	+	Analog input AI6
86	-	
87	+	24 V DC for external power supply (max. approx. 500 mA)
88	-	

1): Closed when without current (normal closed)

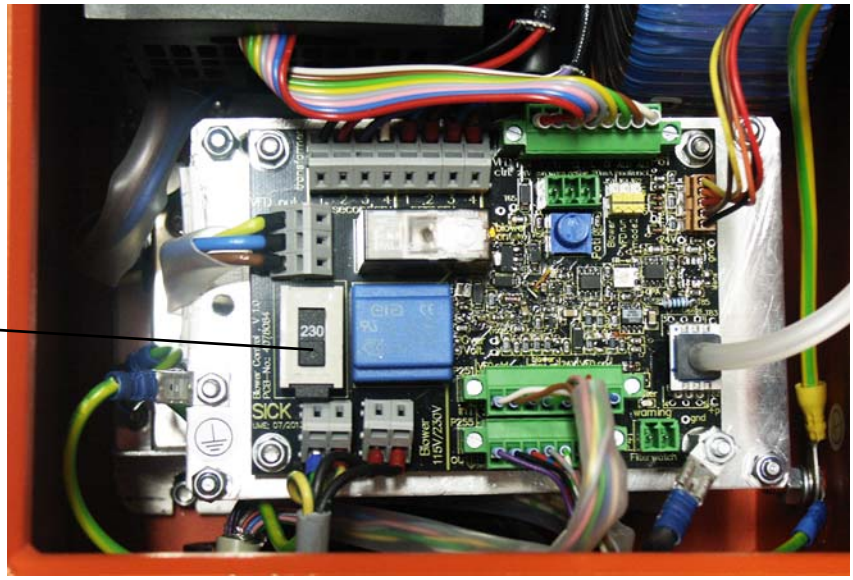
2): Open when without current (normal open)

Subject to change without notice

3.3.2.2 Connecting the blower unit and supply voltage

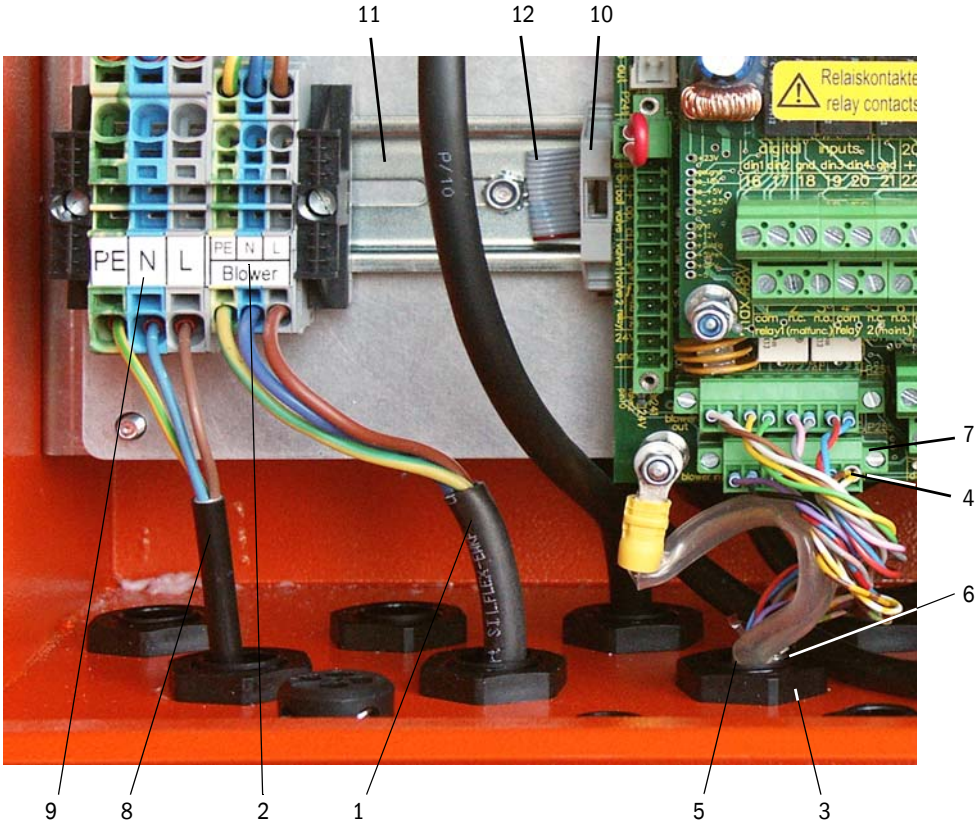
► Check that changeover switch (1) for power supply is set to the supply voltage available at the installation location and, if not, set as required.

Fig 25 Switch for supply voltage in the blower unit



Subject to change without notice

Fig 26 Connecting the blower unit and supply voltage



- ► Connect the mains cable of blower unit (1) to corresponding terminals (2) in the control unit.
- ► Unscrew nut (3) from the PG screw fitting (belongs to control cable).
- ► Push plug-in connector (4) with control cable (5) through the opening in the control unit (closed in Fig. 26 through PG screw fitting (6)), insert the PG screw fitting through the opening and screw together with the nut and plug the plug-in connector on connection (7) on the processor board.
- ► Connect the suitable 3-wire mains cable (3) with sufficient cross-section from the onsite power supply to the corresponding terminals (9) in the control unit.
- ► Close off unused cable openings with dummy plugs.

WARNING:

- ► Be sure to check the wiring before switching the supply voltage on.
- ► Only modify wiring when disconnected from the power supply and potential-free.

3.3.3 Fitting and connecting the Interface module option

- ► Loosen the fuse for ribbon cable (10) (→ Fig. 26) on top hat rail (11) and plug the plug-in connector of ribbon cable (12) on the Interface module (→ p. 139, §7.3.4).
- ► Push the onsite network cable through a free PG screw fitting, connect to the Interface module and plug the Interface module onto the top hat rail.

Subject to change without notice

3.3.4 Installing the backpurge option (only necessary when ordered separately)

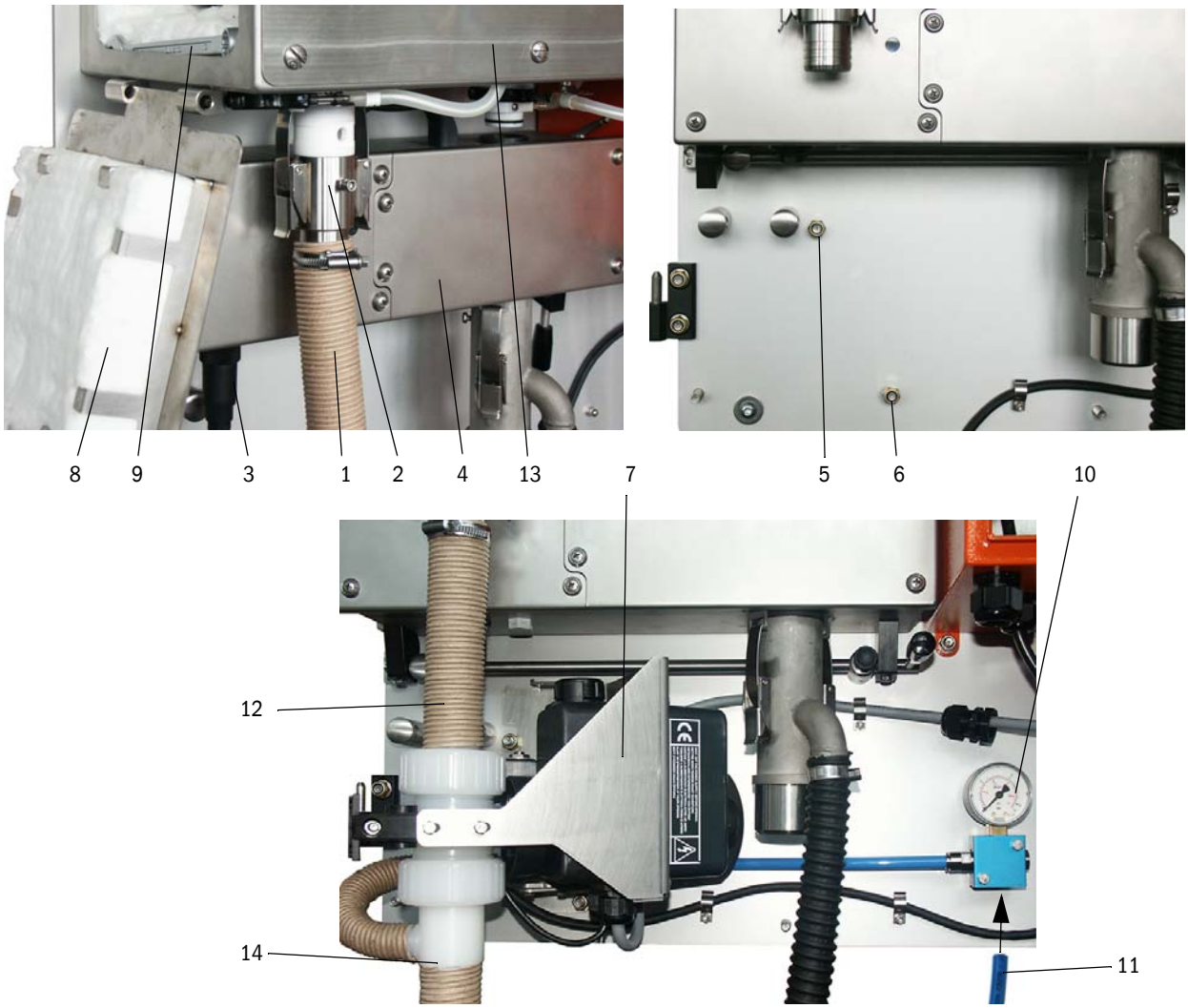
Fit the backpurge subassembly onto the measuring and control unit

- ► Disconnect extraction hose (1) from connection of adapter (2), take the adapter off and loosen connection cable (3) to the control unit from measuring sensor (4).
- ► Loosen top fastening nut (5) and remove lower nut (6), position backpurge subassembly (7) on the bolts on the base plate and fasten with the nuts.

> The SW13 jaw wrench (9) located behind the flap of thermo cyclone (8) can be used to loosen/tighten the nuts.

- ► Fasten pressure monitor (10) on the base plate and connect onsite compressed air hose (11) to the pressure sensor.
- ► Connect hose piece (12) from the ball valve to the connection of adapter (2) and attach the adapter on thermo cyclone (13) again.
- ► Connect extraction hose (1) to connection (14) of the backpurge subassembly.
- ► Connect connection cable (3) to the control unit on measuring sensor (4) again.

Fig 27 Fitting the backpurge subassembly onto the measuring and control unit

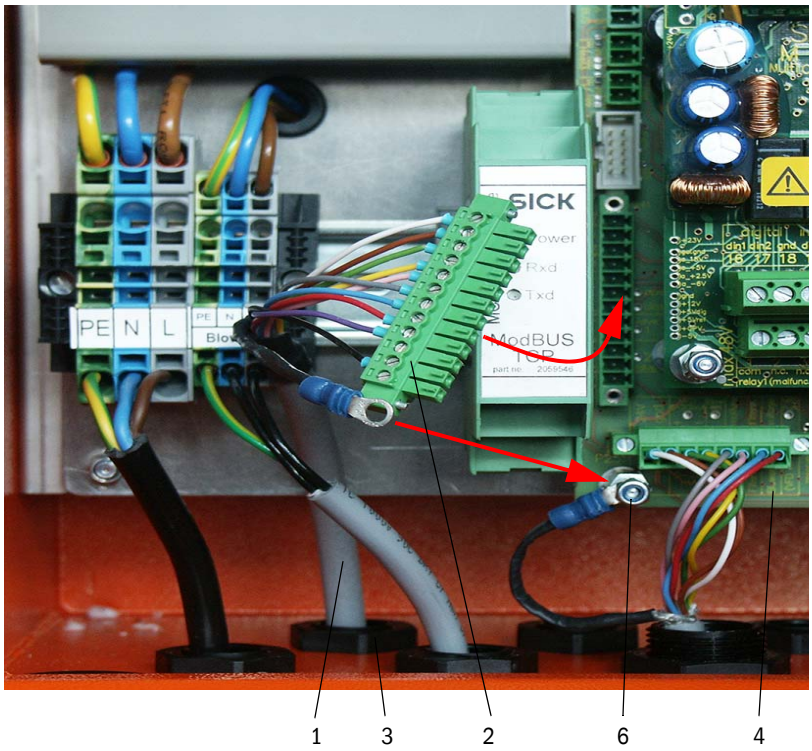


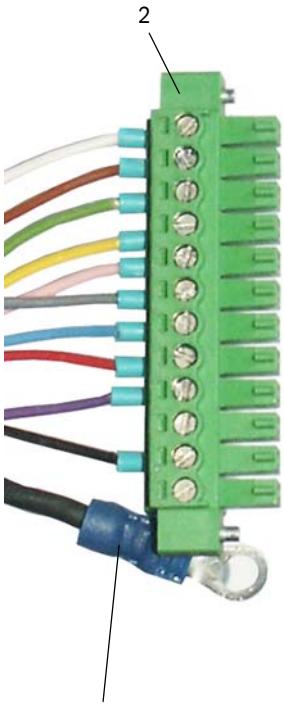
Subject to change without notice

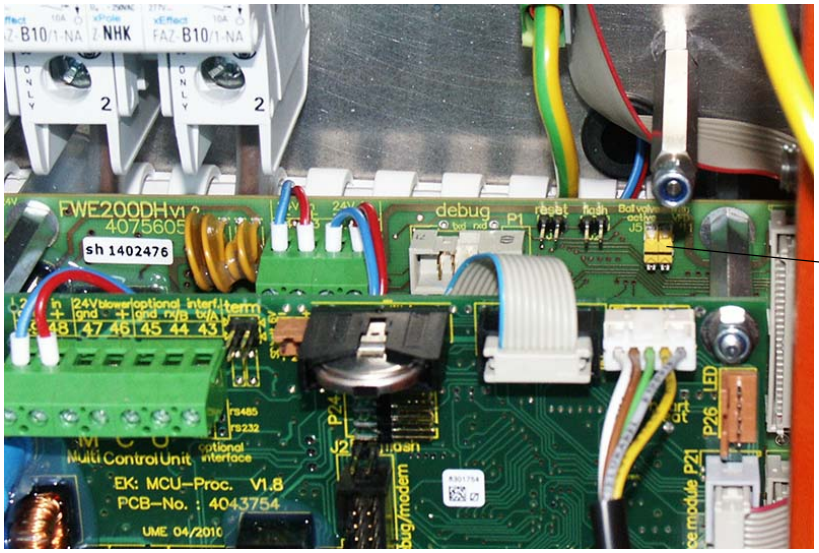
Connect the backpurge option

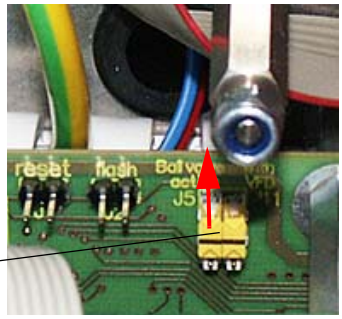
- ► Loosen the wires of connection cable (1) on plug-in connector (2), pull the cable through one of the rear PG screw fittings (3) and connect the wires, color correct, to the plug-in connector again.
- ► Plug the plug-in connector onto the system control processor board (4) and cable shoe (5) on with separator bolt (6).
- ► Switch actuation switch (7) to the upper position.

Fig 28 Connecting the backpurge option









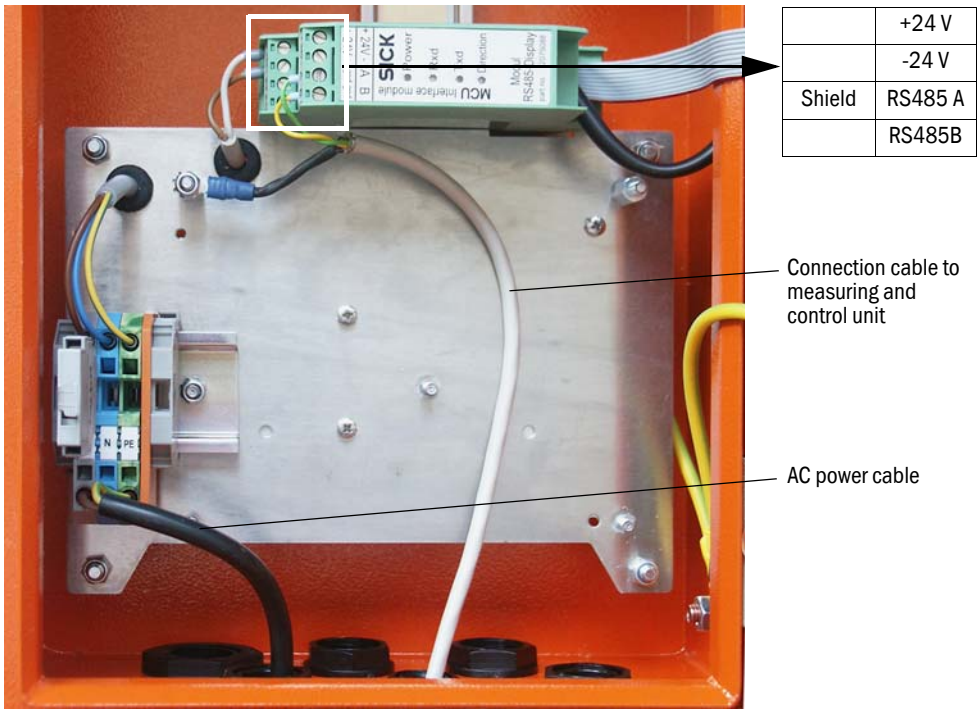
Subject to change without notice

3.3.5 Connecting the remote unit option

Version without power supply unit

► Connect the connection cable to the measuring and control unit (4-wire, twisted pair, with shield) to the connections in the control unit (→ p. 41, Fig. 23) and the module of the remote unit.

Fig 29 Connections in the remote unit (version with integrated wide-range power pack)



Version with integrated wide-range power pack:

► Connect the 2-wire cable (twisted pair, with shield) to the connections for RS485 A/B and shield in the control and remote unit.

► Connect the 3-wire mains cable with sufficient cross-section to the onsite power supply and the corresponding terminals in the remote unit.

NOTICE:

► During installation, it must be possible to switch the power supply off using a power isolating switch/circuit breaker in accordance with EN 61010-1.

► After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

Subject to change without notice

Subject to change without notice

FWE200DH

4 Start-up and Configuration

Putting the FWE200DH into operation
Basics
Setting standard parameters
Setting the Interface module parameters
Activating the backpurge option
Operating/setting parameters via the LC-Display

Subject to change without notice

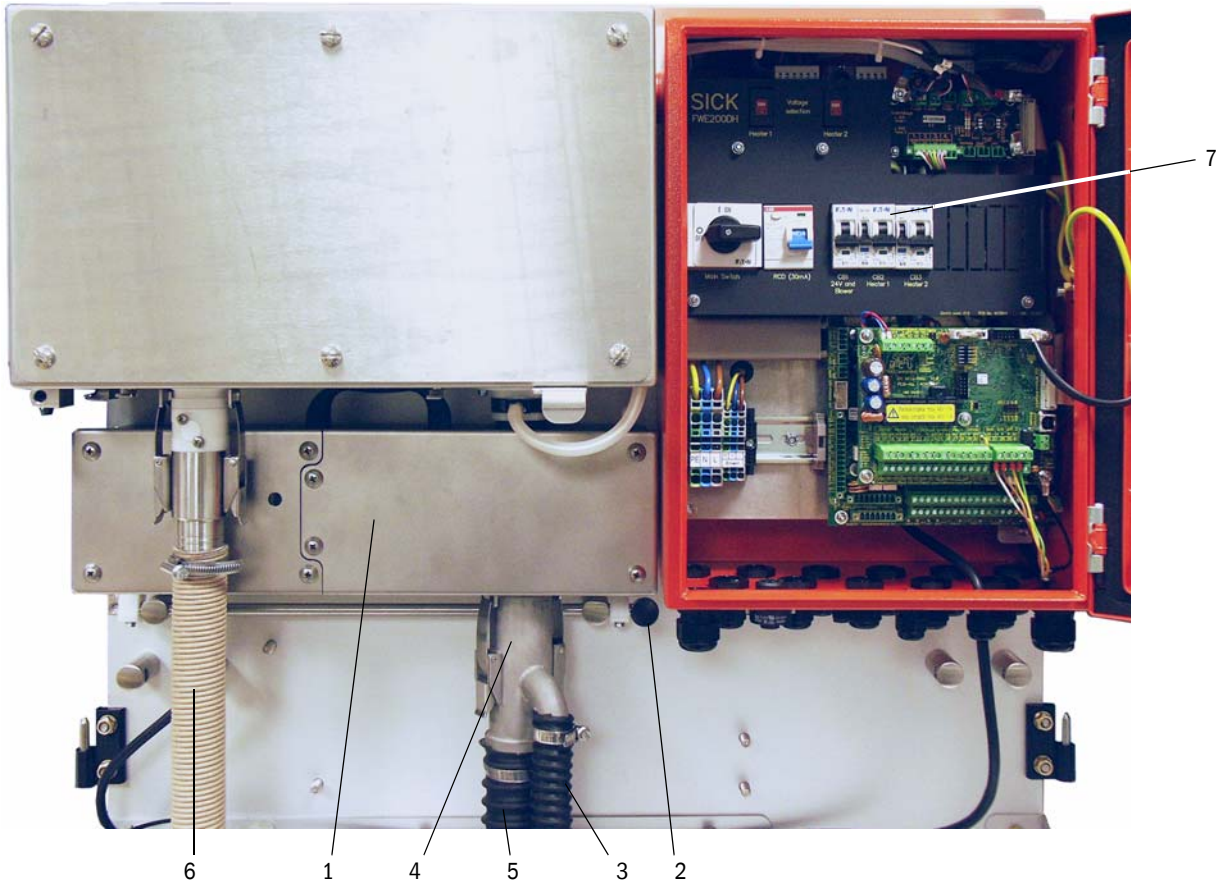
4.1 Putting the FWE200DH into operation

Prerequisite for carrying out the activities described in the following is completion of the assembly and installation of the measuring and control unit and blower unit as described in Section 3.

4.1.1 Preparatory work

- ► Check that measuring sensor (1) is in the measuring position (safety lever (2) must be in the upper position, → Fig. 30) and is locked.
- ► Push the NW 25 flexible hose (3) (belongs to the blower unit) onto the connection on ejector (4) and secure with a hose clip.
- ► Push the NW 50 hose (5) for gas return (scope of delivery) over the connections on the ejector and sample gas probe and secure with hose clips.
- ► Connect the NW 32 hose (6) for gas extraction to the connections of the thermo cyclone and sample gas probe.
- ► Open the door of the control cabinet door of the measuring and control unit and check that all fuses (7) are switched on (if not, switch on).

Fig 30 Measuring and control unit



- ► Check that the switchover for the heater voltage (→ p. 41, Fig. 22) and power supply of the blower unit (→ p. 45, Fig. 25) are set to the supply voltage available at the installation location; if not, switch accordingly.
- ► Switch the main switch on.

Subject to change without notice

4.1.2 Starting the FWE200DH

The start phase of the FWE200DH starts when the main supply voltage is switched on.

The start process runs as follows:

Function	Marginal conditions
Switch main supply voltage on	
↓	
Heating bands 1 and 2 of the thermo cyclone are heated up	
↓	
Blower unit is switched on automatically	• When average value of heat band temperatures “Heat1” and “Heat2” ≥ Tnominal + warning threshold • or “Heat1” or “Heat2” ≥ 200 °C
↓	
End of start phase	• When sample gas temperature “T_Gas2” = T nominal • When switching to maintenance mode

The current measured values are displayed on the LC-Display of the control unit (→ p. 28, Fig. 13, → p. 107, §4.6.4.) The start phase is signaled with “Initialization” instead of “Operation”.

Relay 4 (maintenance) is active during the start phase. Any malfunctions possibly present are not reported to relay 1 (operation/malfunction) during this time.

The start phase finishes when the sample gas temperature reaches the set nominal value for the first time (average duration approx. 30 min). If this value is not reached (e.g., due to gas wetness too high/gas temperature too low in duct), error “Heating up phase” is displayed on the LC-Display after 1 hour.

After the start phase has finished, warnings and malfunction messages are displayed on the LC-Display (apart from when the sample gas temperature exceeds the tolerance range [standard value for warning = Tnominal - 10 K; standard value for malfunction = Tnominal ± 30 K]) and output on relay 1.

The blower unit is switched off when:

- The gas temperature sinks below the malfunction threshold value
- The average value of the temperatures from heating bands 1 and 2 sinks below 80 °C
- For certain device malfunctions (see Service Manual for details).

Subject to change without notice

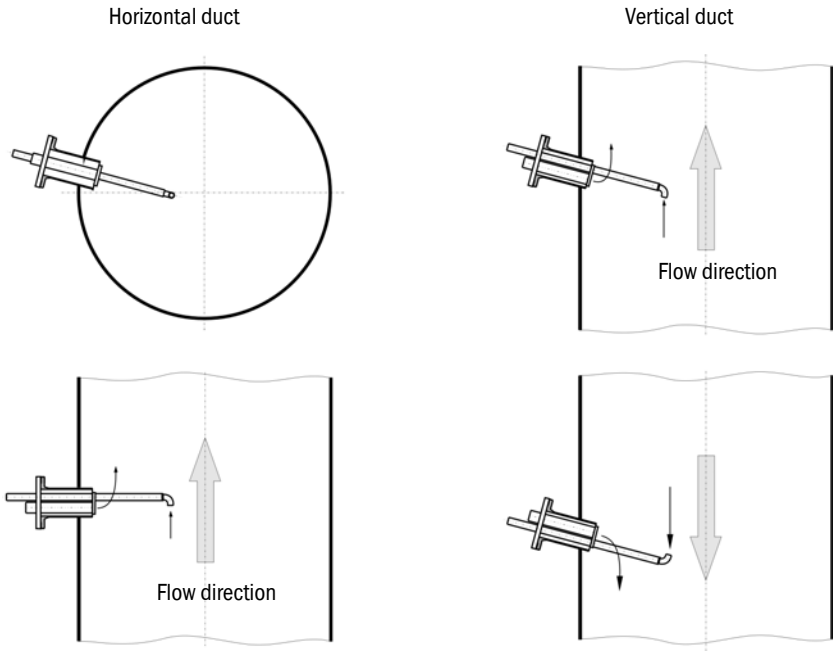
4.1.3 Fitting the sample gas probe

WARNING: Danger from exhaust gas

- ► Only fit the sample gas probe on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.
- ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.

- ► Check that the suitable suction nozzle according to Table p. 18, §2.2.2 is screwed onto the extraction pipe; if not, correct accordingly.
- ► Insert the sample gas probe in the flange with tube according to Fig. 31 and fasten. The extraction opening of the probe must point in flow direction.

Fig 31 Sample gas probe alignment



Subject to change without notice

4.2 Basics

4.2.1 General information

Prerequisite for work described in the following is completion of the assembly and installation as described in Section 3.

Start-up and parameter setting comprise:

- Fitting and connecting the sender/receiver unit,
- Customizing parameter settings according to the respective requirements.

To achieve exact measurement, the measuring system must first be calibrated using a gravimetric comparison measurement (→ p. 68, §4.3) before being used for continuous measurement of dust content.

The operating and parameter program SOPAS ET is provided to set the parameters. The Menu structure simplifies changing settings. Further functions are also available (e.g., data storage, graphic displays).

4.2.2 Installing the operating and parameter program SOPAS ET

Administrator rights are required to install software.

Prerequisites

- Laptop/PC with:
  - Processor: Pentium III (or comparable type)
  - USB interface (alternative - RS232 via adapter)
  - Working memory (RAM): At least 512 MB
  - Operating system: MS-Windows 2000/XP/Vista, Windows 7 (not Windows 95/98/NT)
- USB interface cable to connect the laptop/PC to the measuring system (control unit).
- The operating and parameter program as well as the USB driver (scope of delivery) must be installed on the laptop/PC.
- The power supply must be switched on.

Start the file “setup.exe” when the start screen does not appear.

Install the SOPAS ET program

Insert the delivered CD in the PC drive, select the language, select “Software” and follow the instructions.

Install the USB driver

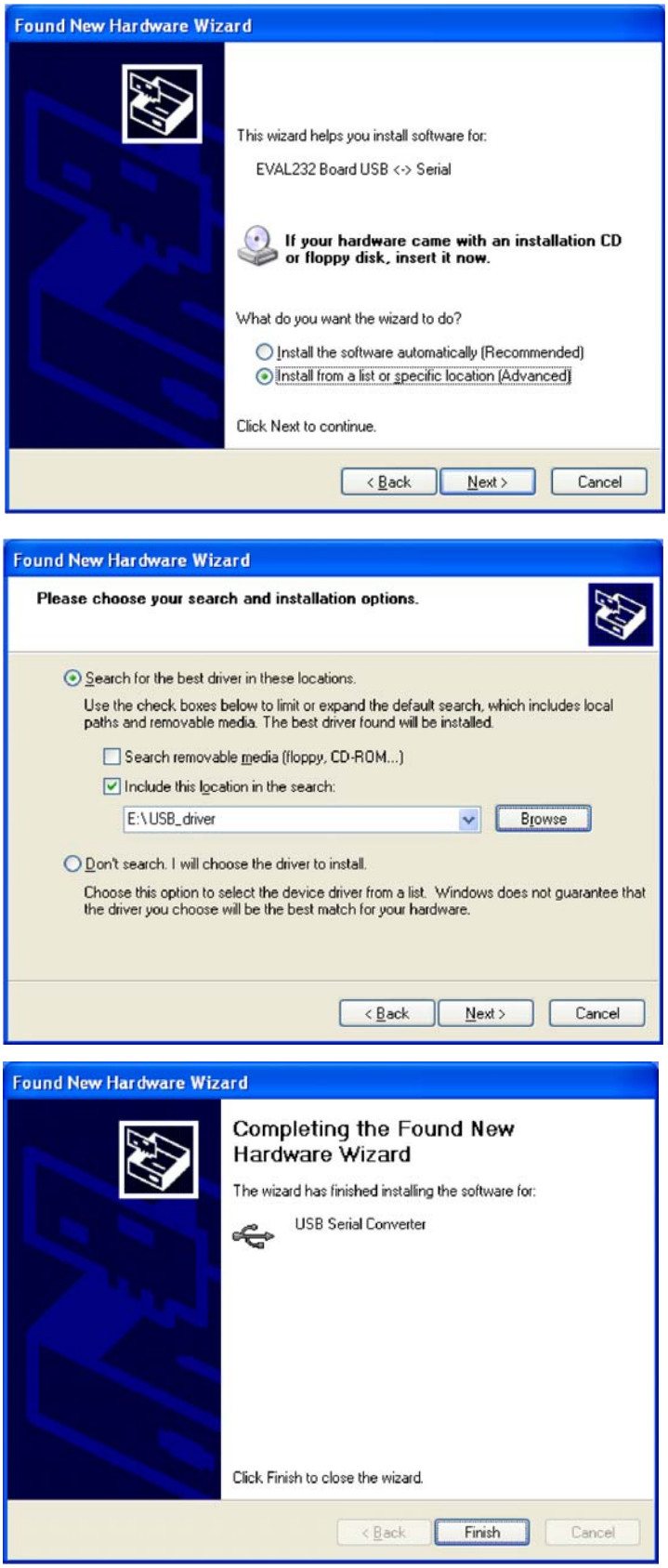
A special software driver is required for communication between SOPAS ET and the measuring system via the USB interface. Connect the measuring system to the supply voltage and to the PC via USB connector to install the driver on the laptop/PC. A message appears on the display that new hardware has been detected. Now insert the delivered CD in the PC drive and follow the installation instructions (→ p. 56, Fig. 32).

The driver can also be installed using the hardware installation program in the Windows Control Panel.

The USB driver creates a new COM port to be used for connecting SOPAS ET to the device (→ p. 58, §4.2.3.2).

Subject to change without notice

Fig 32 Installing the USB driver



Subject to change without notice

4.2.3 Connecting the device

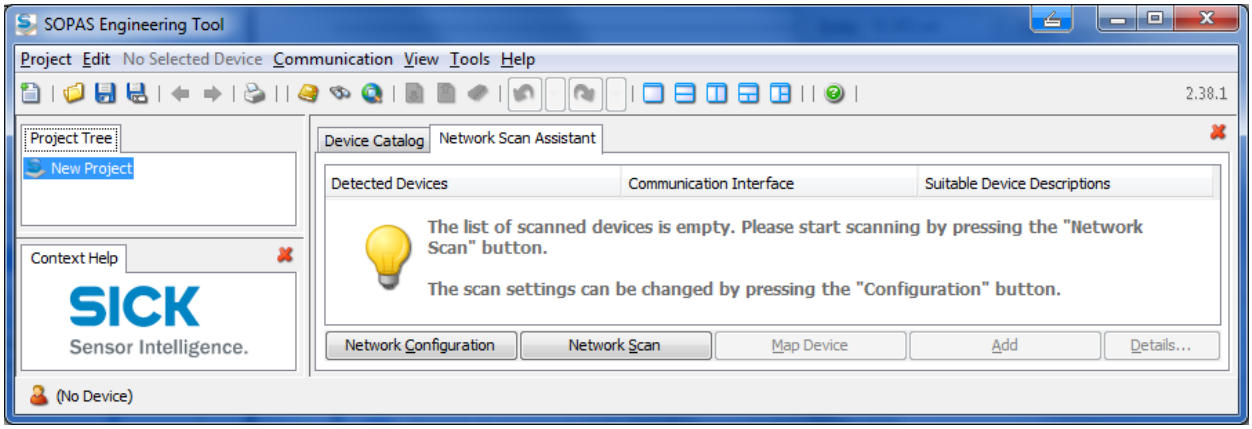
4.2.3.1 Basic settings

- ► Connect the USB cable to the control unit (→ p. 41, Fig. 23) and the laptop/PC.
- ► Start “SOPAS ET” and click “Create a new project”.

Fig 33 Start dialog

The following start menu appears.

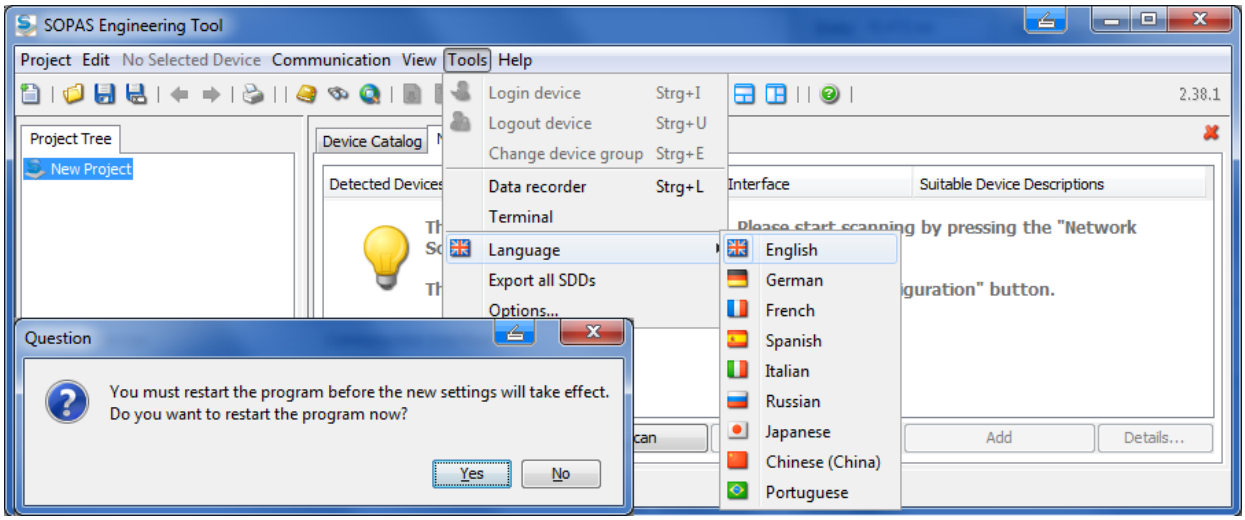
Fig 34 Start menu



- ► If required, set the desired language in menu “Tools / Language” (→ p. 58, Fig. 35; only German and English available at present), confirm with “OK” and restart the program.

Subject to change without notice

Fig 35 Changing the language setting



4.2.3.2 Configuring the interface

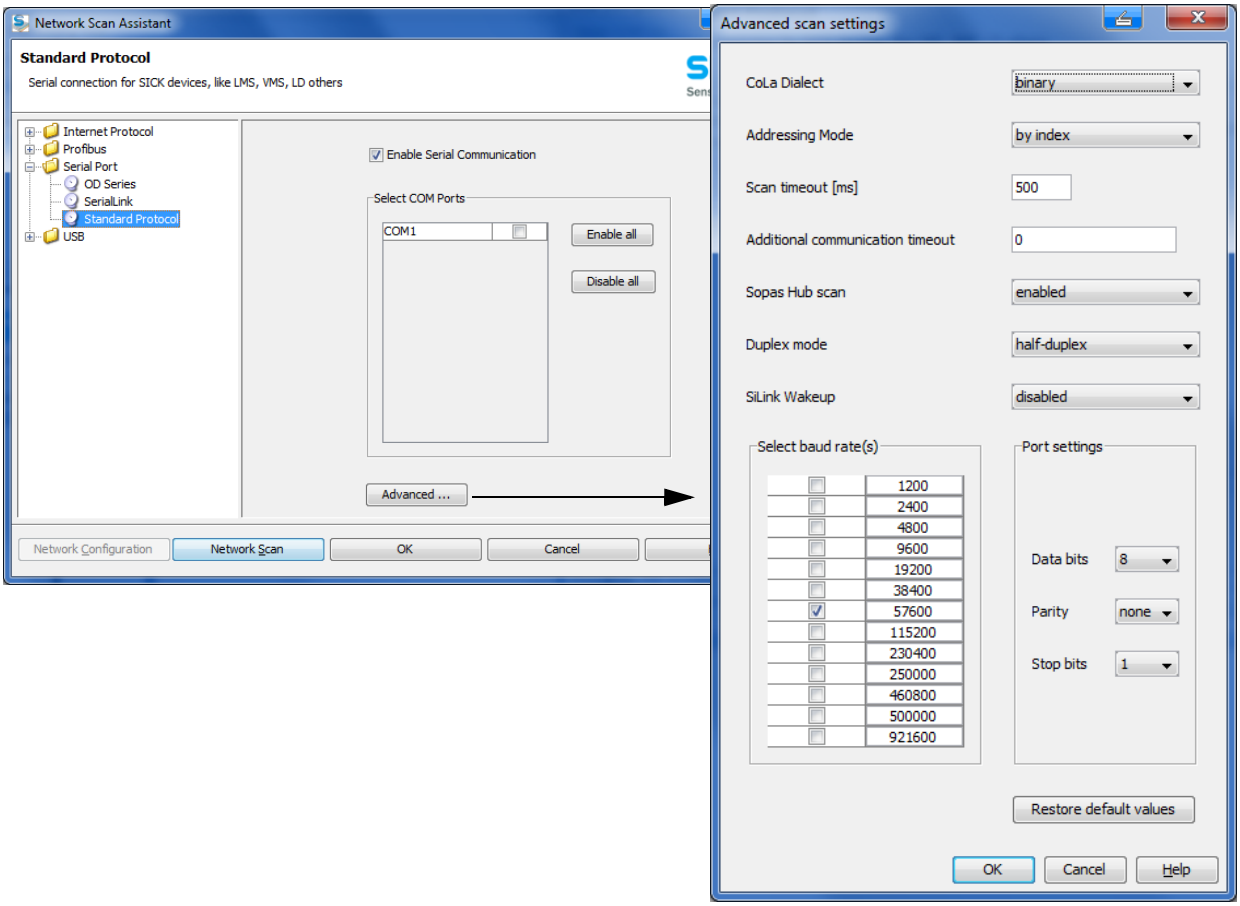
In order to keep the connection setup as short as possible, we recommend deactivating communication channels not used or required (IP communication, standard protocol or USB) → p. 59, Fig. 36) .

Subject to change without notice

COM port

- Click the “Network configuration” button in the Start menu (→ p. 57, Fig. 34) and select “Standard Protocol”.
- Select the interface that appears after connection of control unit and laptop/PC in the “Select COM Ports” group, click “Advanced” and configure according to Fig. 36 (settings are only required during the first connection to the measuring system).

Fig 36 COM port selection and configuration (COM port number depends on the laptop/PC)



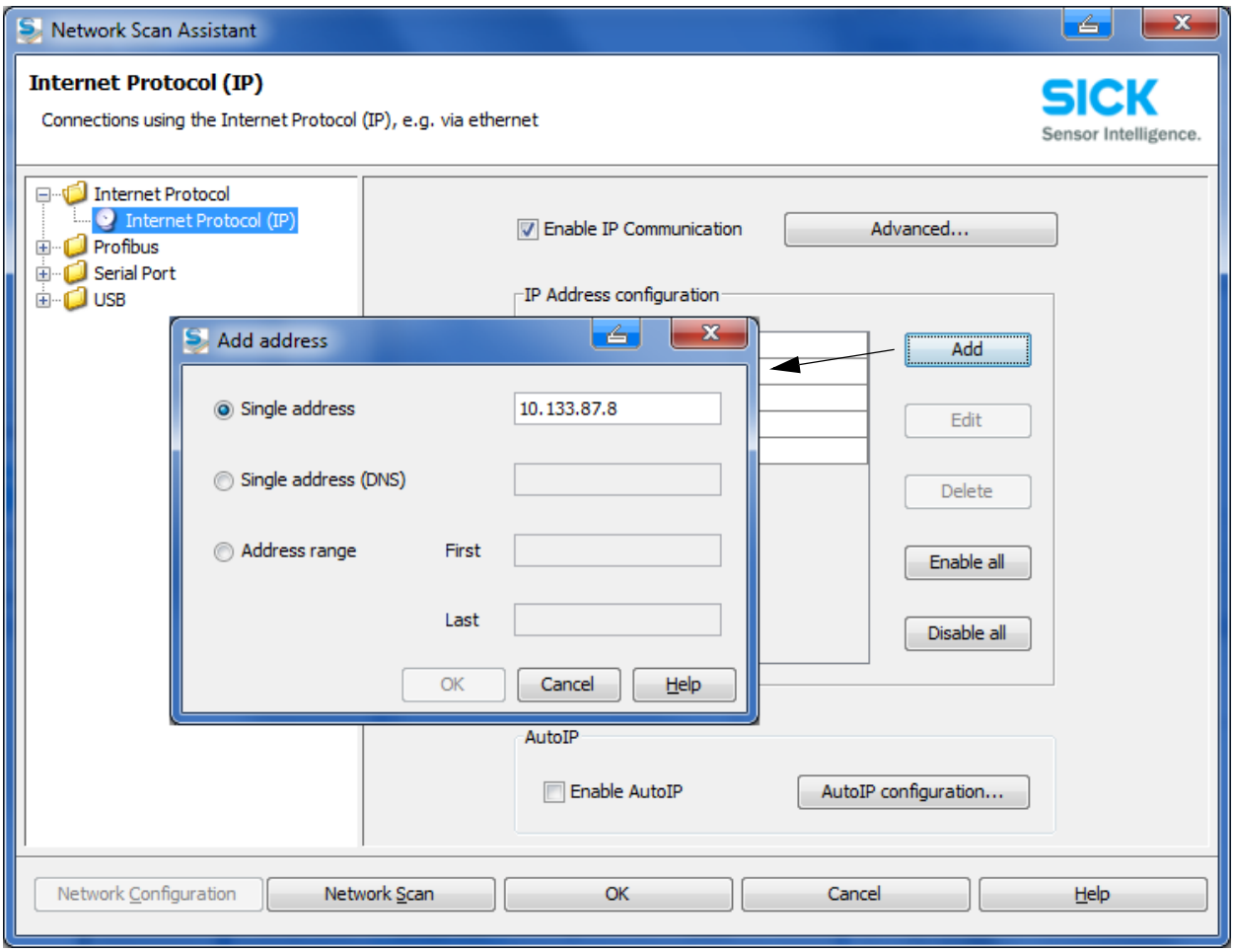
Subject to change without notice

Ethernet

The Ethernet interface module (→ p. 139, §7.3.6) must be installed in the control unit (→ p. 46, §3.3.3) and configured (→ p. 98, §4.4.2.2) to connect to the measuring system via Ethernet.

- ► Click “Network Configuration” in the start menu (→ p. 57, Fig. 34) and select “Internet Protocol (IP)”.
- ► Click “Add”, enter the IP address and confirm with “OK”.

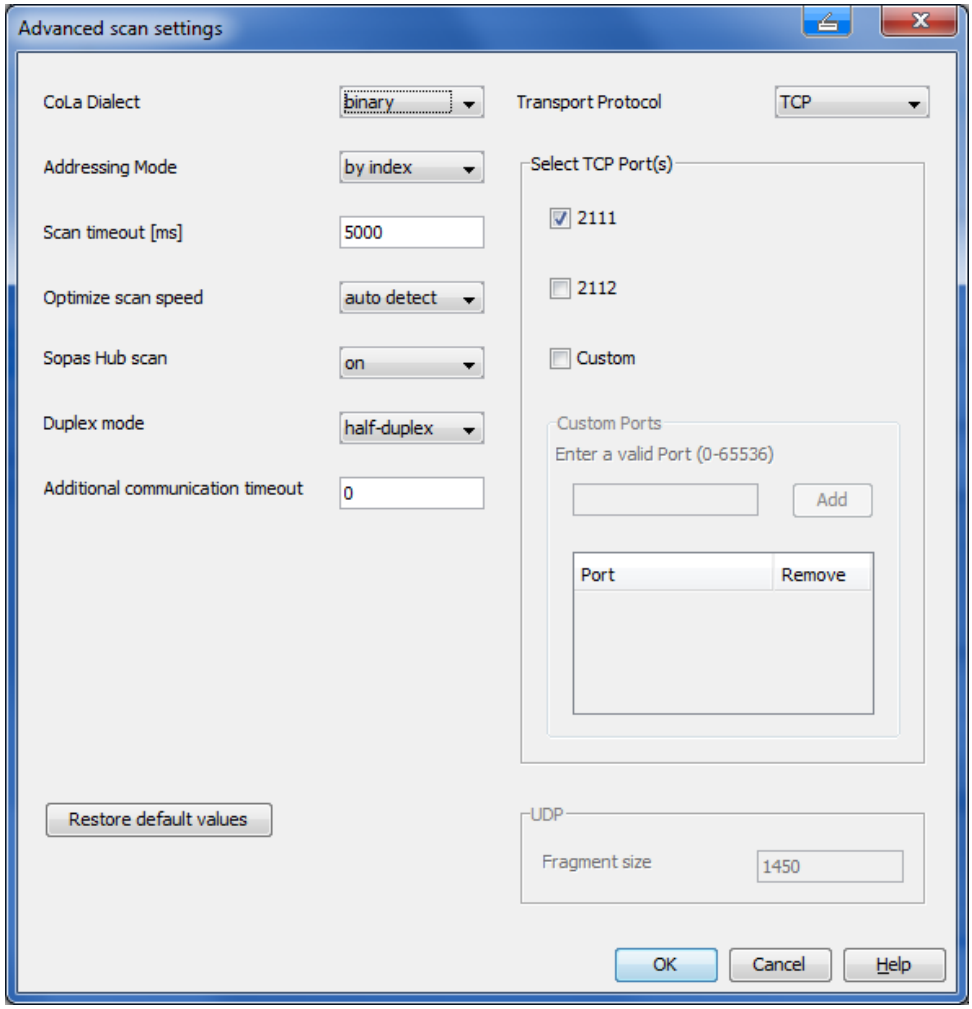
Fig 37 Ethernet interface selection (example settings)



Subject to change without notice

► Click “Advanced” and configure the interface according to Fig. 38.

Fig 38 Ethernet interface configuration



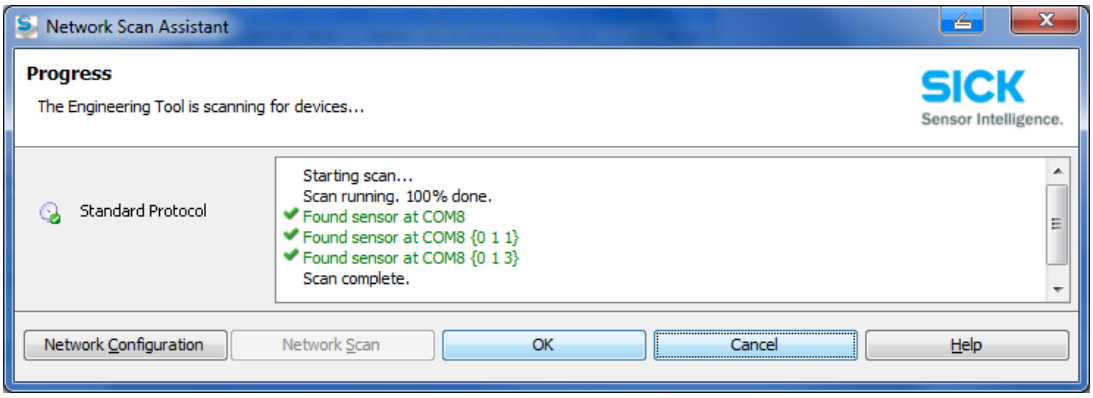
Subject to change without notice

4.2.3.3 **Connecting using the “Network Scan Assistant” tab**

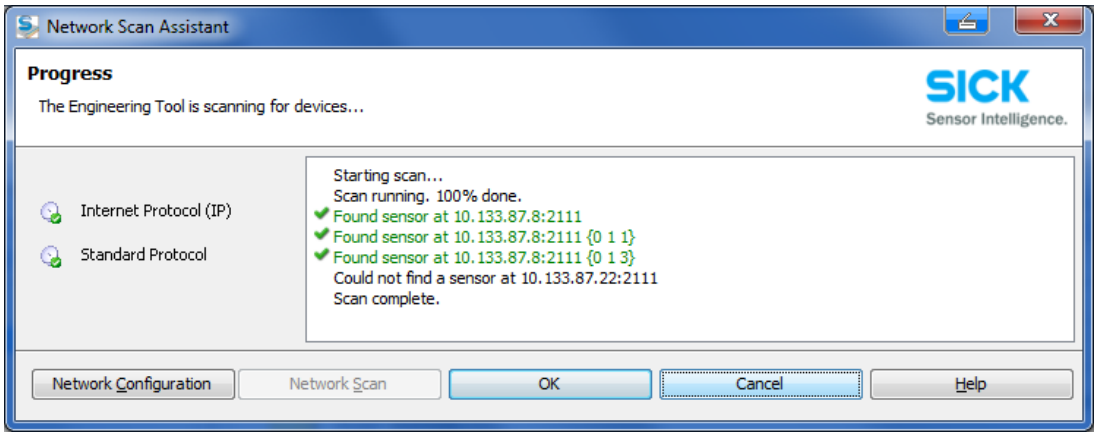
► Click “Network Scan” in the “Network Scan Assistant” tab.

Fig 39 Search for connected devices (COM port number depends on the laptop/PC)

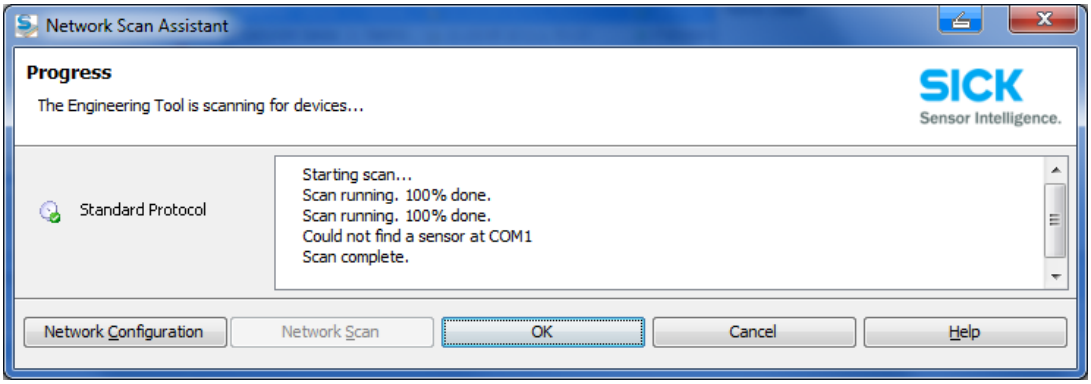
Connection via COM port



Connection via Ethernet (addresses are system-dependent)



The following message appears when no device is found (Troubleshooting, see Service Manual):



Problems on connections via Ethernet can be due to incorrect addressing → Contact your system administrator.

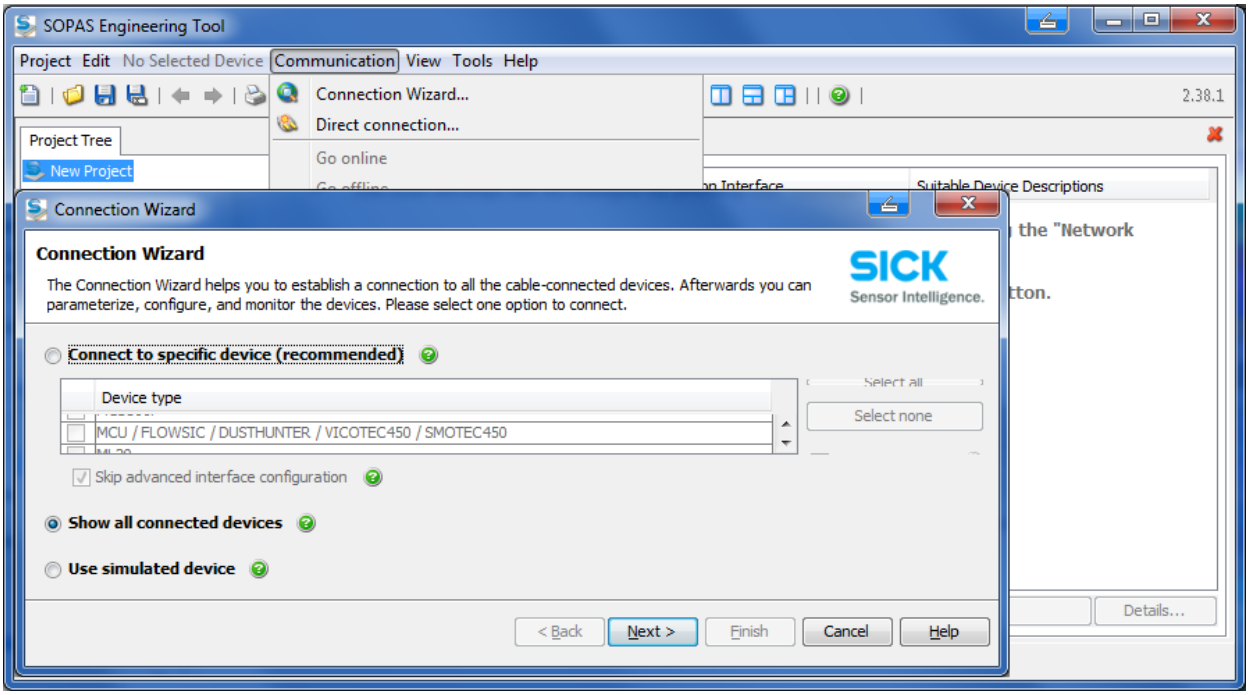
► Confirm search for connected devices with “OK”.

Subject to change without notice

4.2.3.4 Connecting using the “Connection Wizard” menu (valid as from SOPAS ET Version 02.32)

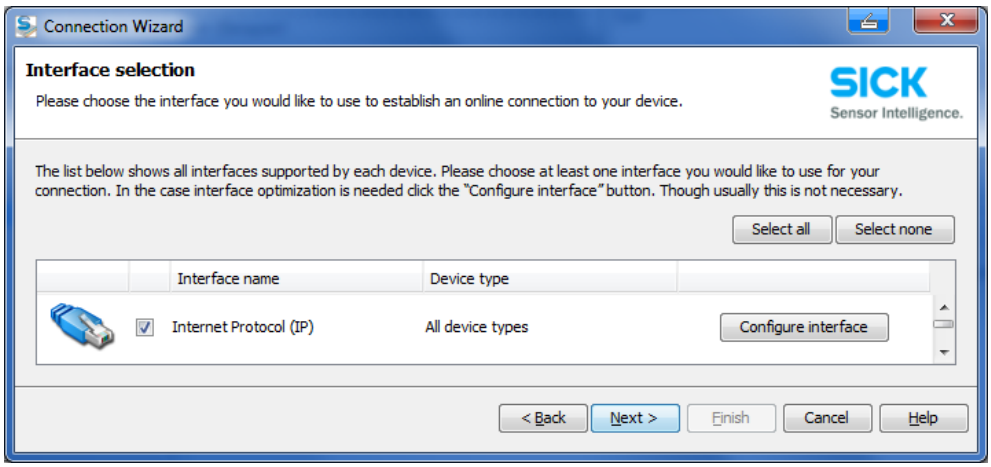
► Select menu “Connection Wizard” and activate selection “Show all connected devices”.

Fig 40 “Communication / Connection Wizard” menu



► Click “Next” and select the interface (“Standard Protocol” for connection via COM port, “Internet Protocol (IP)” for connection via Ethernet).

Fig 41 Interface selection (shown for IP communication)



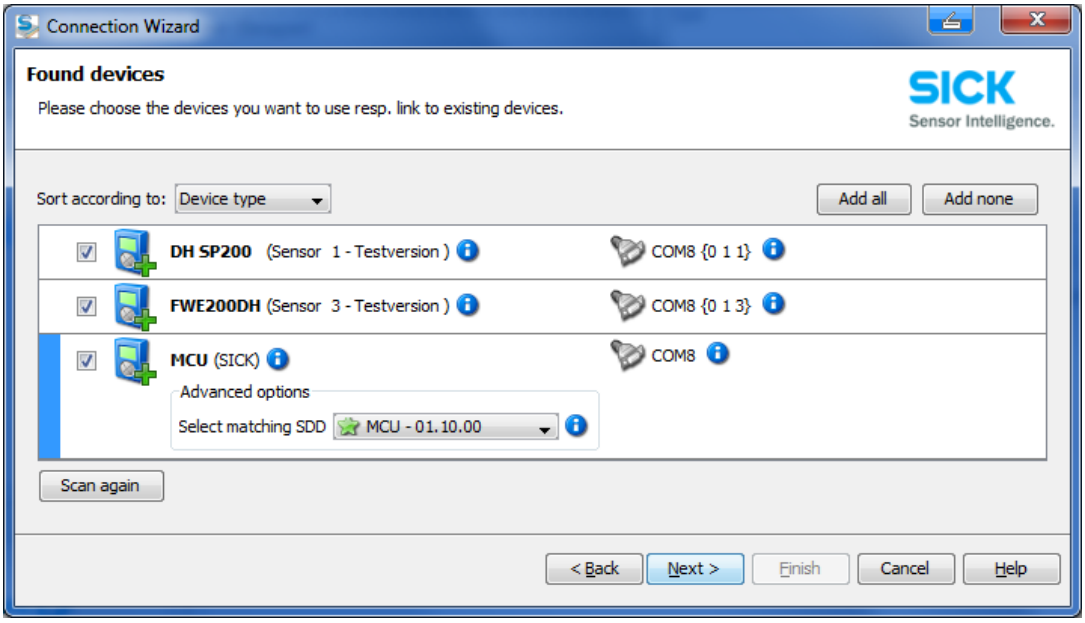
► Check the interface configuration for settings according to p. 58, § 4.2.3.2 and change accordingly if necessary.

► Click “Next”.

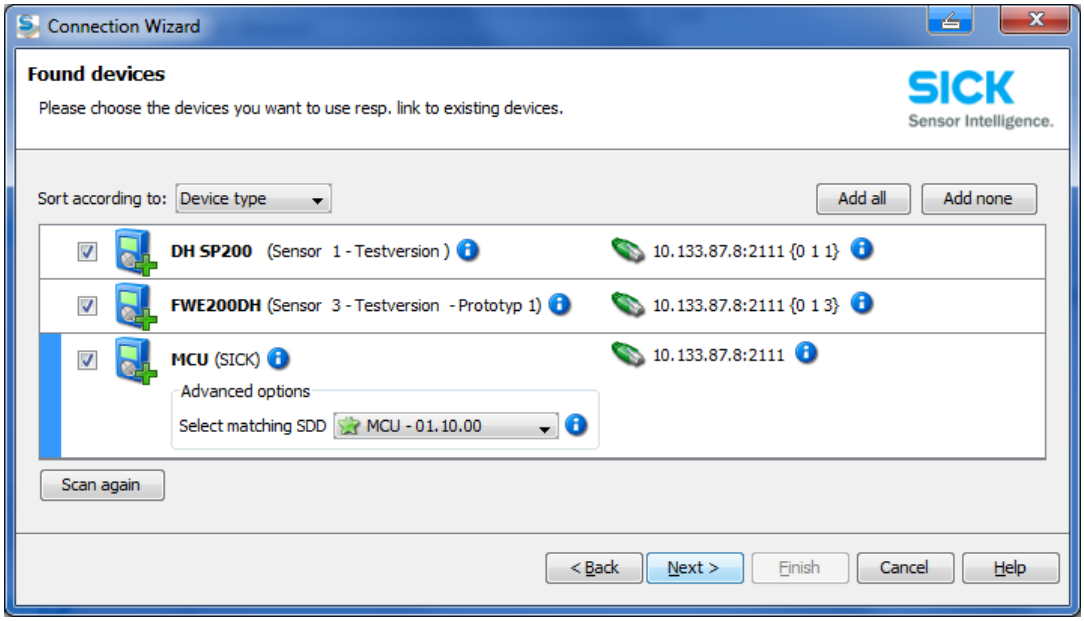
Subject to change without notice

Fig 42 Search for connected devices

Connection via COM port (interface name “Standard protocol”, → p. 63, Fig. 41)



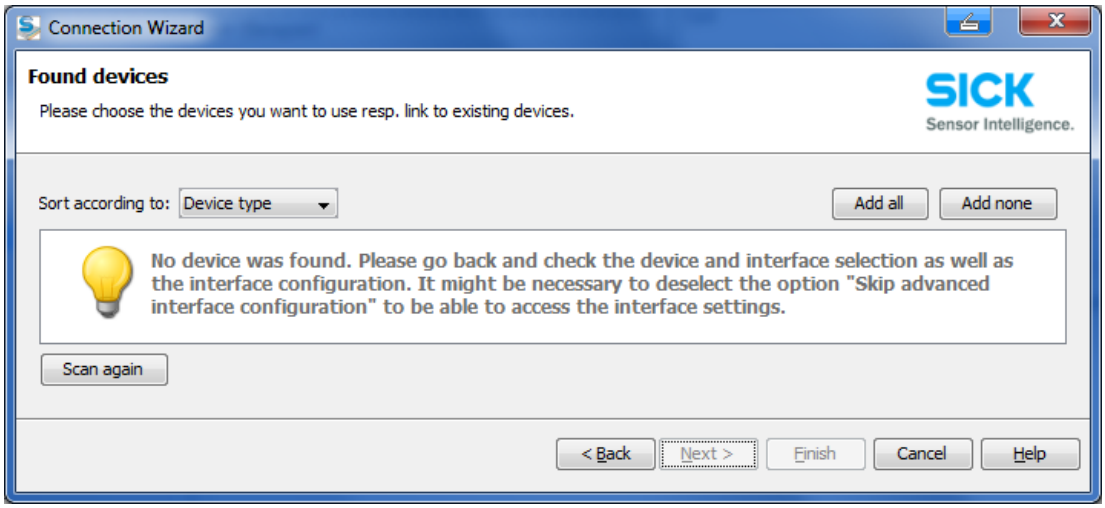
Connection via Ethernet



Subject to change without notice

The following message appears when no device is found (Troubleshooting, see Service Manual):

Fig 43 Connection error



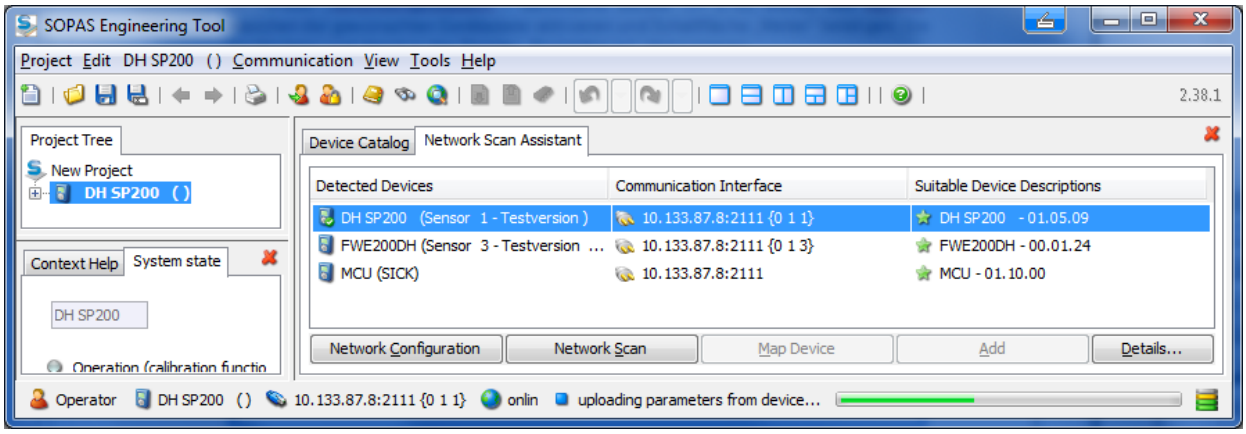
Subject to change without notice

4.2.3.5 Select device

Connection via COM port / Ethernet

Select the required device file in the “Network Scan Assistant / Detected devices” tab and move it to the “Project Tree” window (drag-and-drop per mouse or click “Add”).

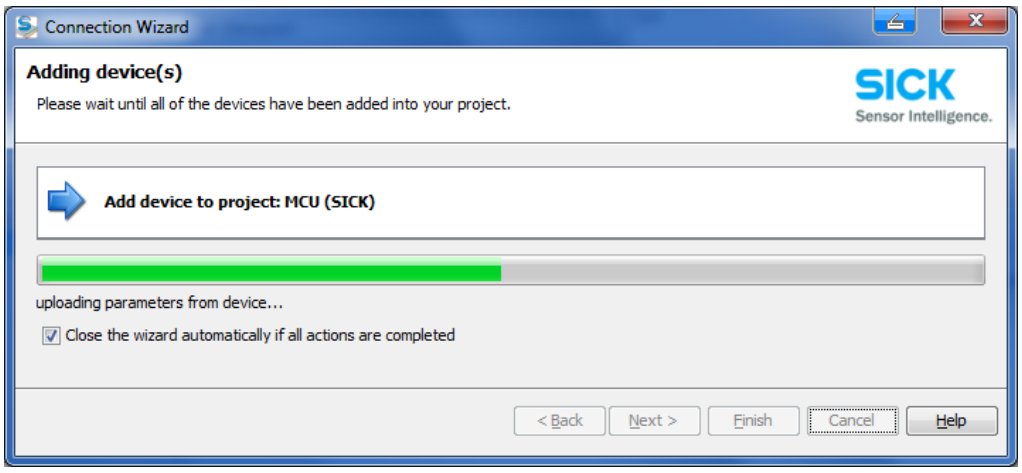
Fig 44 Select device file (example)



Connecting via “Connection Wizard”

Activate the checkbox of the required device file in the “Connection Wizard / Found devices” (→ p. 64, Fig. 42) and click “Next >”. This transfers the device file to the “Project tree” window.

Fig 45 Select device file (example)

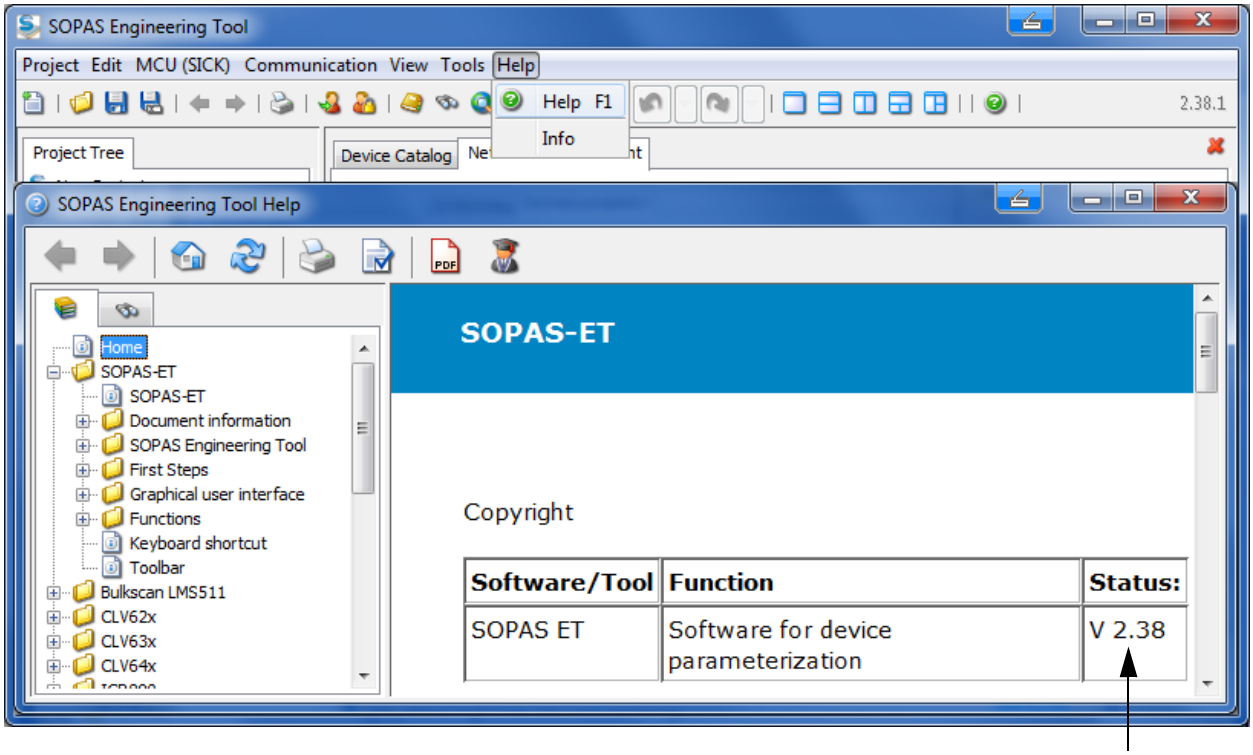


Subject to change without notice

4.2.4 Online help

The individual menus and setting options are described in detail in the online help and are therefore not described further here.

Fig 46 Online help



Subject to change without notice

4.3 Setting standard parameters

Password

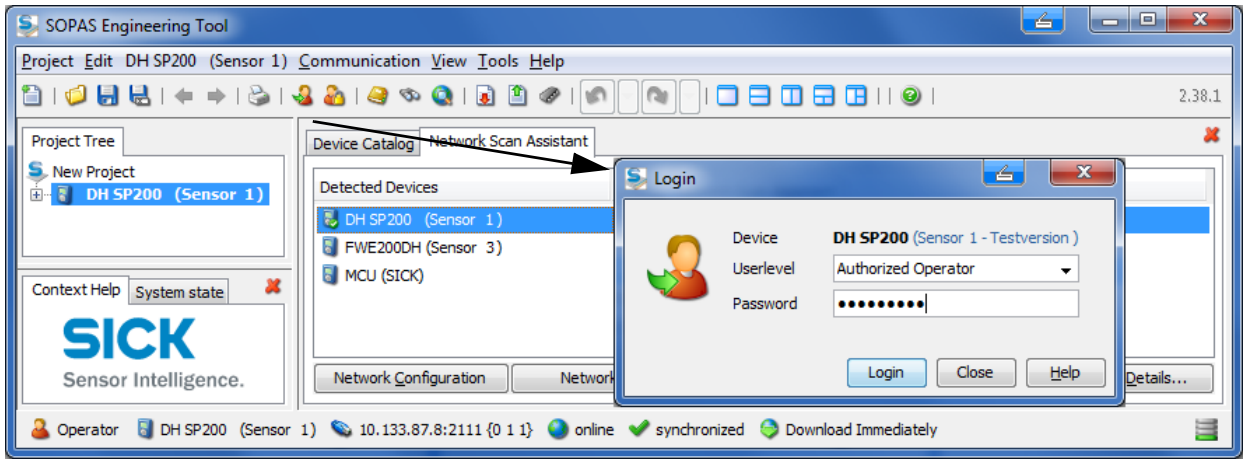
Certain device functions are first accessible after a password has been entered (→ Fig. 47). Access rights are assigned in 4 levels:

User level		Access to
0	“Operator”	Displays measured values and system states
1	“Authorized Operator”	Displays, inquiries and parameters required for start-up or adjustment to customer-specific demands and diagnosis
2	“Authority”	
3	“Service”	Displays, inquiries as well as all parameters required for service tasks (e.g., diagnosis and clearance of possible malfunctions)

The level 1 password is contained in the Annex.

The level 1 password is contained in the Annex.

Fig 47 Password entry and language selection



Subject to change without notice

4.3.1 Factory settings

Parameter			Value	
Sample gas temperature	Nominal value		160°C	
	Value for warning		< 150 °C and > 180 °C	
	Value for malfunction		130°C	
Differential pressure (flow monitoring)			0.8 hPa	
Function check			Every 8 h; output of control values (every 90 s) on standard analog output	
Analog output (AO)	Live zero (LZ)		4 mA	
	Upper measuring range value (MBE)		20 mA	
	Current during maintenance		0.5 mA	
	Current by malfunction		21 mA (optional 1 mA)	
Response time			60 s for all measured variables	
Measured variable		Output on AO	Value at LZ	Value at MBE
Dust concentration		1	0 mg/m³	200 mg/m³
Scattered light intensity		2	0	200
Regression function 1			Function type polynomial	
Coefficients set (only for dust concentration)			0.00 / 1.00 / 0.00	
Regression function 2			Function type polynomial	
Coefficients set (only for dust concentration)			0.00 / 1.00 / 0.00	

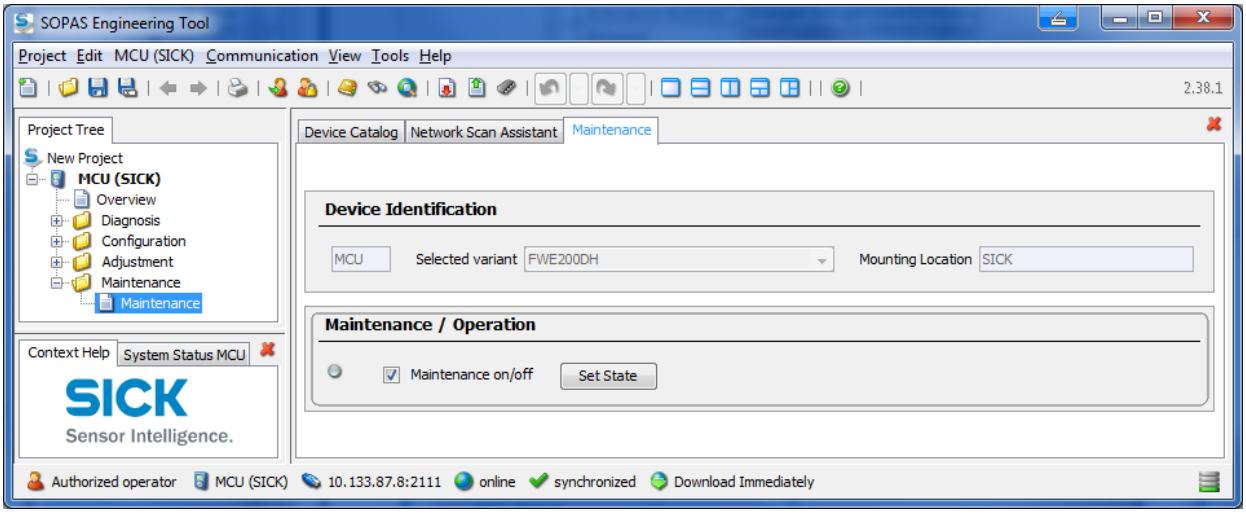
The steps required to modify these settings are described in the following Sections. Prerequisite: The device data are located in the “Project Tree” window, the level 1 password has been entered and “Maintenance” mode set.

Subject to change without notice

4.3.2 Setting “Maintenance” mode

► In the respective device file, switch to directory “Maintenance/Maintenance”, activate the checkbox in the “Maintenance on/off” and click “Set State” to confirm.

Fig 48 Setting “Maintenance” mode (example for MCU)



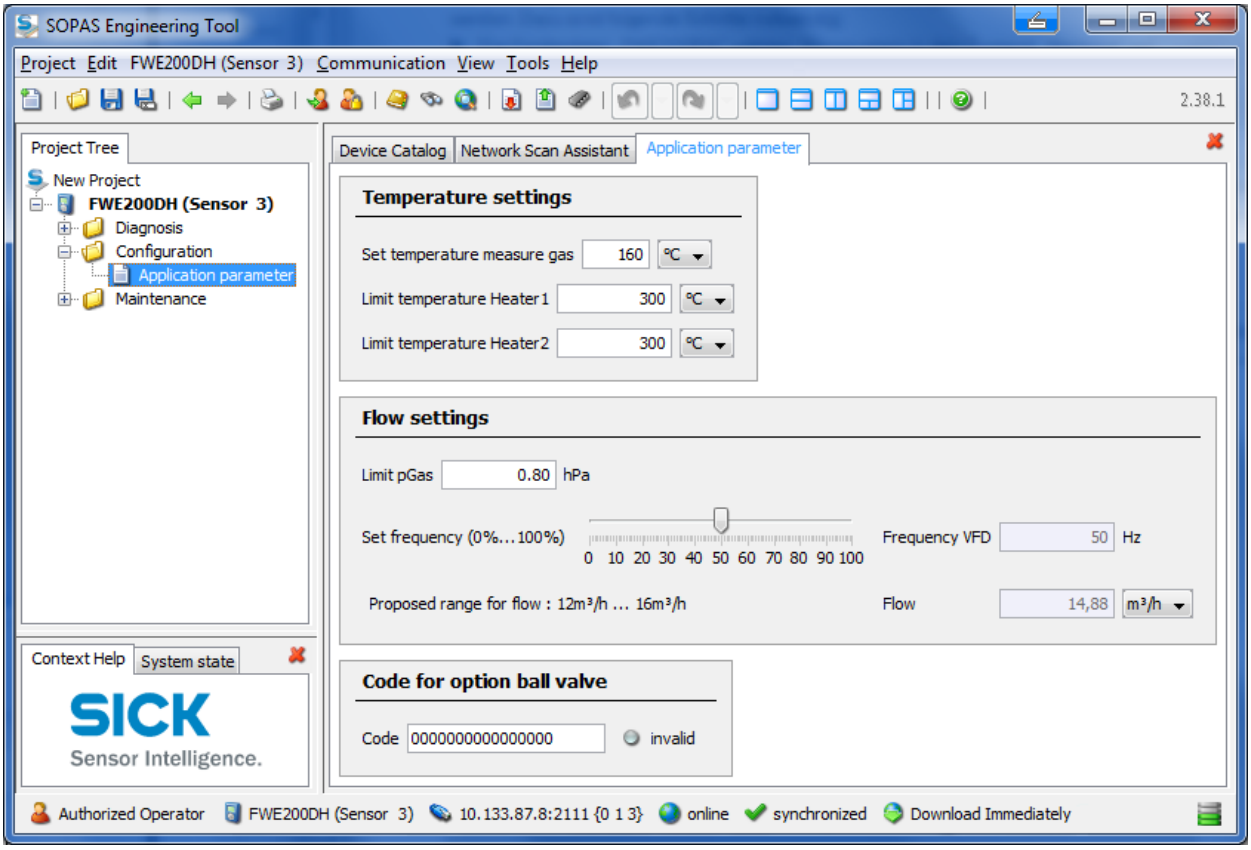
“Maintenance” mode can also be set using the buttons on the LC-Display of the control unit (→ p. 104, §4.6.2) or by connecting an external maintenance switch to the terminals for Dig In2 (17, 18) in the control unit → p. 41, §3.3.2).

Subject to change without notice

4.3.3 Changing function parameters

Select device file “FWE200DH” to change temperature and pressure settings and switch to directory “Configuration / Application Parameter”.

Fig 49 Changing function parameters (example)



4.3.3.1 Change temperature settings

In certain cases, it can be necessary to change the nominal value for sample gas temperature (e.g., for acid dew point temperature > 160 °C) and/or heater temperature(s)). To do this, enter the desired values in the respective windows in the group “Temperature settings” (→ p. 71, Fig. 49).

4.3.3.2 Define limit value for the flow rate

The differential pressure measured between the thermo cyclone and measuring cell can be used for flow monitoring. Entering a limit value triggers a message when underflown. This can serve to prevent the flow (e.g., due to deposits in the gas path) from sinking below the value required for normal device operation by initiating maintenance measures in good time.

Subject to change without notice

The FWE200DH outputs the following messages:

Message	Monitoring value	Signals
Warning	Differential pressure measured less than 1.5 times the limit value (generated device-internal)	• “Warning Eductor air/flow” displayed on LC-Display • “Warning” relay triggers
Malfunction	Differential pressure measured less than limit value	• “Malfunction Eductor air/flow” displayed on LC-Display • Relay “Malfunction” triggers

- The flow is not monitored when the blower is not in operation, i.e., there are no warning or malfunction messages.
- Monitoring is active during the start phase (until the sample gas has reached the nominal temperature or max. 1 hour after the start) when a limit value has been entered. When the flow is too low, this is only displayed on the LC-Display. The warning or malfunction relays do not trigger because the maintenance relay is still active during the start phase.
- The hysteresis for the limit value is 10 %.

For setting, enter a value in window “Limit pGas” in group “Flow settings” (→ p. 71, Fig. 49) corresponding to approx. 33% of the differential pressure shown on the LC-Display after flow adjustment according to p. 55, §4.2. The gas path must be free from deposits in this case.

Recommendation

– Average differential pressure 1.5 - 2.0 hPa: Limit value 0.7 hPa
– Average differential pressure 2.0 - 2.5 hPa: Limit value 0.8 hPa
– Average differential pressure 2.5 - 3.0 hPa: Limit value 0.9 hPa

4.3.3.3 Set the suction

The following steps are necessary to adapt the suction to the equipment conditions:

► Check the gas path for deposits, clean when necessary.
► Set the frequency in group “Flow setting” (→ p. 71, Fig. 49) using the slider so that the value displayed in window “Flow” is within the recommended range.

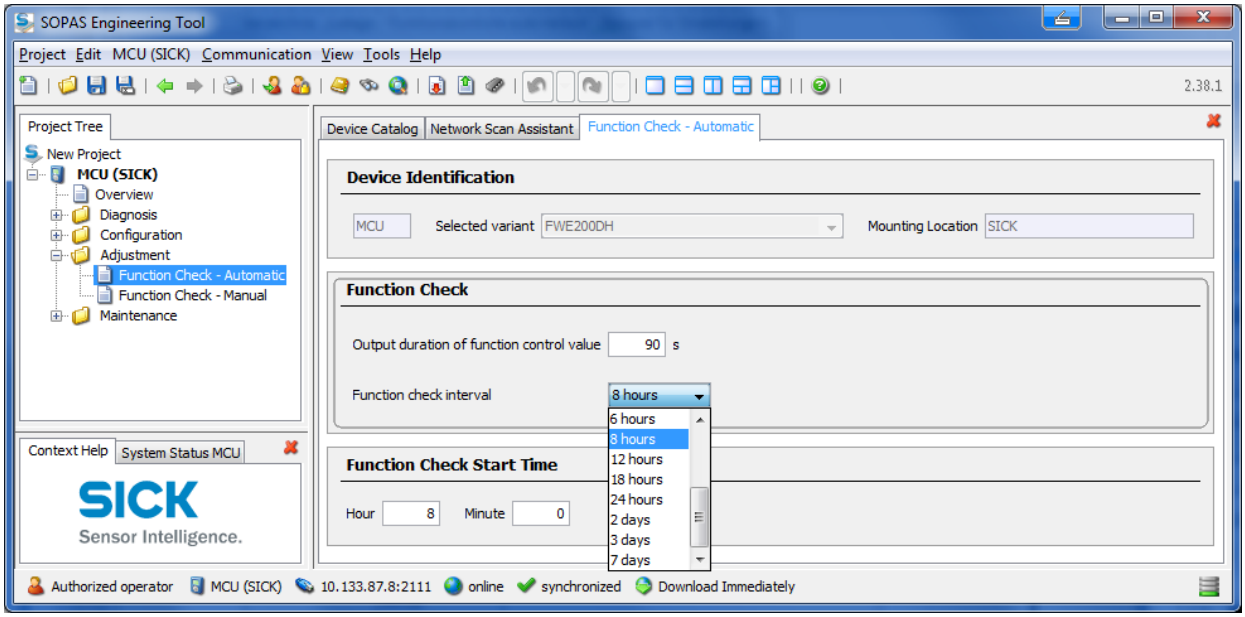
The flow can be set to the lower value of the recommended range for very low gas temperatures and/or high gas wetness and/or low ambient temperatures.

Subject to change without notice

4.3.4 Setting the function check

To change the values set at the factory (→ p. 69, §4.3.1), select device file “MCU” and switch to directory “Adjustment / Function Check - Automatic”. The interval time, control value output on the analog output and the start timepoint for automatic function check can be changed here.

Fig 50 “Adjustment / Function Check - Automatic” directory (example for settings)



Entry field	Parameter	Remark
Output duration of function control value	Value in seconds	Output duration of control values.
Function check interval	Time between two check cycles	→ p. 19, §2.2.5
Function Check Start Time	Hours	Defining a start timepoint in hours and minutes.
	Minutes	

The last value measured is output during control value determination (→ p. 20, Fig. 4).

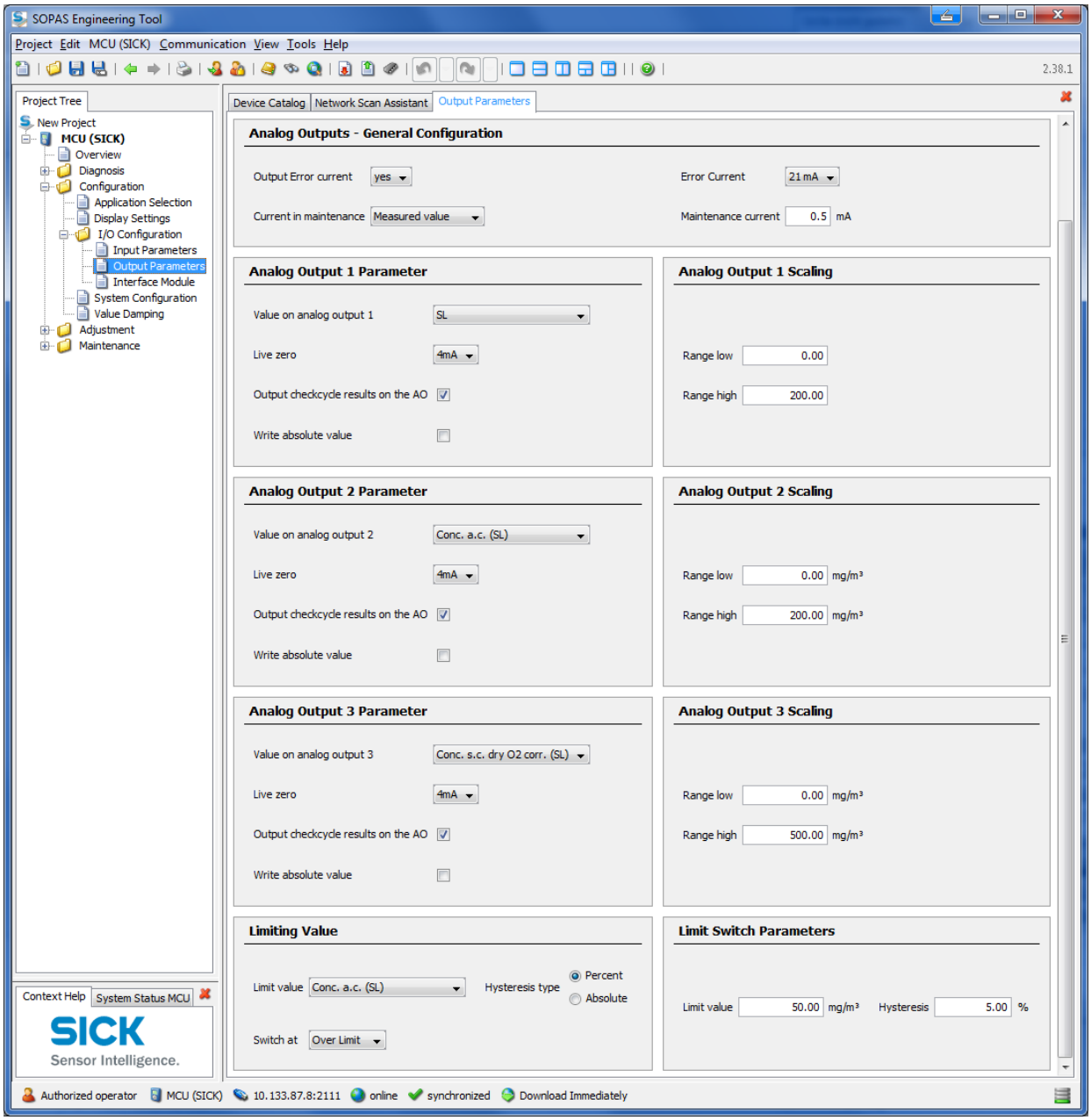
Subject to change without notice

4.3.5 Setting the analog output parameters

Select the “Configuration / IO Configuration / Output Parameters” directory to set the analog outputs.

- Default values → p. 69, §4.3.1
- In order to output the dust concentration under standard conditions (“Conc. s.c.” (SL)), set the parameters for the analog outputs according to §4.3.6.

Fig 51 “Configuration / IO Configuration / Output Parameters” directory



Subject to change without notice

Field		Parameter	Remark	
Analog Outputs - General Configuration	Output Error current	Yes	Error current is output.	
		No	Error current is not output.	
	Error Current	Value < Live Zero (LZ) or > 20 mA	mA value to be output in “Malfunction” state (error case) (size depends on connected evaluation system).	
	Current in maintenance	User value	A value to be defined is output during “Maintenance”	
		Last value measured	The value measured last is output during “Maintenance”	
		Measured value output	The current measured value is output during “Maintenance”.	
	Maintenance current	Whenever possible, value ≠ LZ	mA value to be output in “Maintenance” state	
Analog Output 1 Parameter	Value on analog output 1	Conc. a.c. (SL)	Dust concentration under operating (actual) conditions (based on scattered light intensity)	The selected measured variables are output on the analog output.
		Conc.s.c.dry 02 corr. (SL)	Dust concentration under standard conditions (based on scattered light intensity)	
		SL	Scattered light intensity	
		T _Heater 1	Temperature heater 1	
		T _Heater 2	Temperature heater 2	
		T _Heater 3	Temperature heater 3	
		T _Heater 4	Temperature heater 4	
		T_Gas2	Sample gas temperature	
	Live zero	Zero point (0, 2 or 4 mA)	Select 2 or 4 mA to ensure being able to differentiate between measured value and switched off device or interrupted current loop.	
	Output checkcycle results on the AO	Inactive	Control values (→ p. 19, §2.2.5) are not output on the analog output .	
		Active	Control values are output on the analog output .	
	Write absolute value	Inactive	Positive and negative measured values are differentiated.	
		Active	The amount of the measured value is output.	
Analog Output 1 Scaling	Range low	Lower measuring range limit	Physical value at live zero	
	Range high	Upper measuring range limit	Physical value at 20 mA	
Limiting Value	Limit value	Conc. a.c. (SL)	Dust concentration under operating (actual) conditions (based on scattered light intensity)	Select the measured variable for which a limit value is to be monitored.
		Conc.s.c.dry 02 corr. (SL)	Dust concentration under standard conditions (based on scattered light intensity)	
		SL	Scattered light intensity	
		T _Heater 1	Temperature heater 1	
		T _Heater 2	Temperature heater 2	
		T _Heater 3	Temperature heater 3	
		T _Heater 4	Temperature heater 4	
		T_Gas2	Sample gas temperature	
	Hysteresis type	Percent	Assignment of the value entered in the “Hysteris Value” field as relative or absolute value of defined limit value	
		Absolute		
	Switch at	Over Limit	Define the switching direction	
		Underflow		

Subject to change without notice

Field		Parameter	Remark
Limit Switch Parameters	Limit value	Value	The limit value relay switches when the entered value is exceeded or underflown.
	Hysteresis	Value	Define a tolerance for resetting the limit value relay

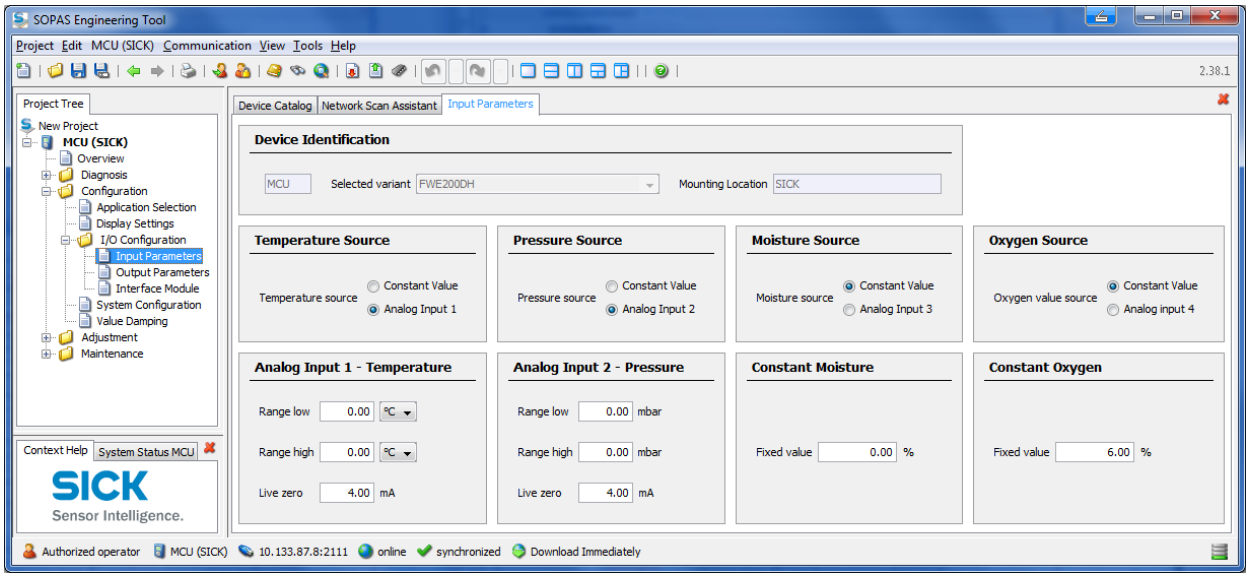
Set the parameters for “Analog Output 2(3) Parameter” and “Analog Output 2(3) Scaling” in the same manner as for “Parameter Analog Output 1” and “Analog Output 1 Scaling”.

Subject to change without notice

4.3.6 Setting the analog input parameters

Select the “Configuration / IO Configuration / Input Parameters” directory to set the analog inputs.

Fig 52 “Configuration / I/O Configuration / Input Parameters” directory



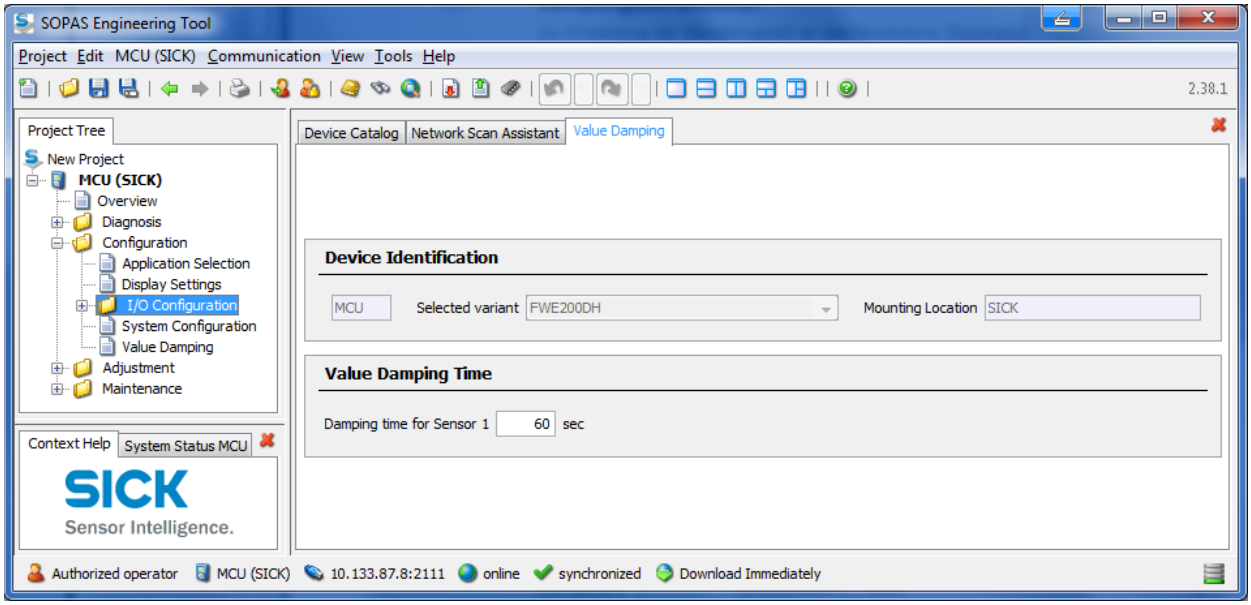
Field	Parameter	Remark
Temperature Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Temperature Constant” field to enter the scaling value in °C or K.
	Analog Input 1	The value from an external sensor connected to analog input 1 (standard scope of delivery) is used to calculate the scaled value. This parameter opens the “Analog input 1 - Temperature” field to set the lower and upper range limit values and the Live Zero value.
Pressure Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Temperature” field to enter the scaling value in mbar (= hPa).
	Analog Input 2	The value from an external sensor connected to analog input 2 (standard scope of delivery) is used to calculate the scaled value. This parameter opens the “Analog input 2 - Pressure” field to set the lower and upper range limit values and the Live Zero value.
Moisture Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Moisture” field to enter the scaling value in %.
	Analog Input 3	The value from an external sensor connected to analog input 3 (optional module required) is used to calculate the scaled value. This parameter opens the “Analog input 3 - Moisture” field to set the lower and upper range limit values and the Live Zero value.
Oxygen Source	Constant Value	A fixed value is used to calculate the scaled value. This parameter opens the “Constant Oxygen” field to enter the scaling value in %.
	Analog Input 4	The value from an external sensor connected to analog input 4 (optional module required) is used to calculate the scaled value. This parameter opens the “Analog input 4 - Oxygen” field to set the lower and upper range limit values and the Live Zero value.

Subject to change without notice

4.3.7 Setting the response time

Select the “Configuration / Value Damping” directory to set the damping time.

Fig 53 “Configuration / Value Damping” directory



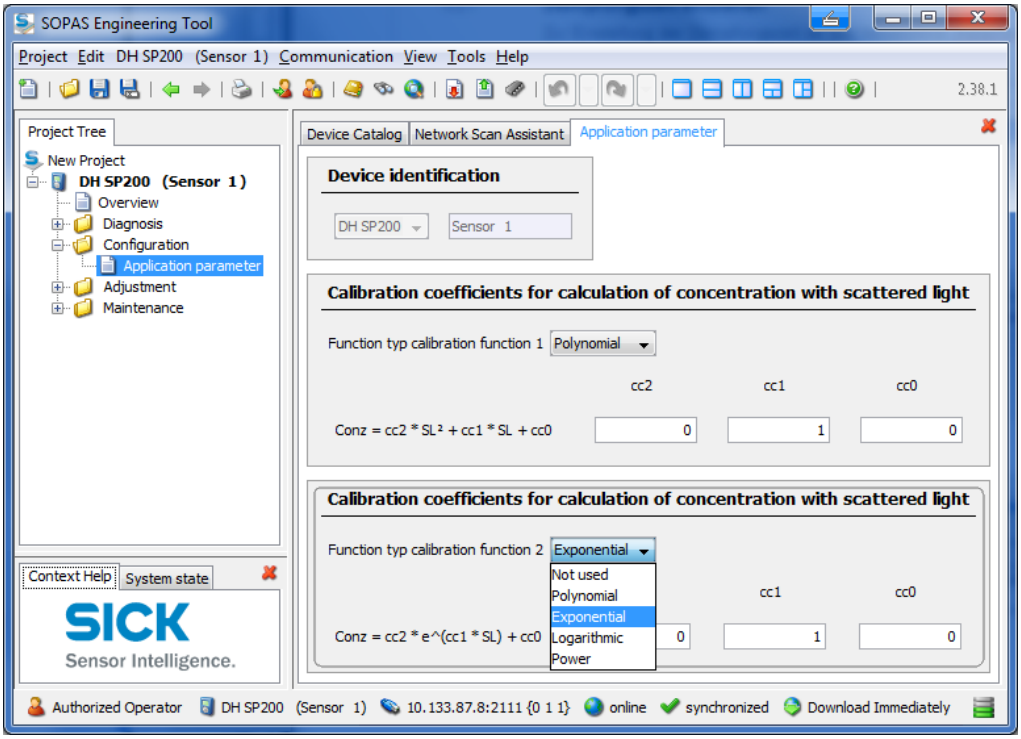
Field	Parameter	Remark
Damping time for Sensor 1	Value in s	Response time for the selected measured variable (→ p. 19, §2.2.4) Setting range 1 ... 600 s

Subject to change without notice

4.3.8 Defining regression coefficients

To change the values set at the factory (→ p. 69, §4.3.1), select device file “DH SP200” and switch to directory “Configuration / Application Parameters”.

Fig 54 “Configuration / Application Parameter” directory



Two different functions, independent of each other, can be selected and configured in the windows “Calibration coefficients for calculation of concentration with scattered light” for calibrating dust concentration measurement (→ p. 80, §4.3.9).

Subject to change without notice

4.3.9 Calibration for dust concentration measurement

NOTICE:

- The steps described here serve to avoid input errors. Carrying out comparison measurements demands special knowledge that cannot be described in detail here.
- The calculation of regression coefficients cc2, cc1 and cc0 from coefficients K2, K1 and K0 are only valid for the polynomial function. The coefficients for other function types (extended calibration function option) must be calculated separately.

For exact dust concentration measurement, the relation between the primary measured variable scattered light intensity and the actual dust concentration in the duct must be established. To do this, the dust concentration must be determined based on a gravimetric comparison measurement in accordance with DIN EN 13284-1 and set in relation to the scattered light values measured at the same time by the measuring system.

Steps to be carried out

- ► Select device file “MCU”, enter the level 1 password (→ p. 68, §4.3) and set the measuring system to “Maintenance” mode (→ p. 70, §4.3.2).
- ► Select the “Configuration / IO Configuration / Output Parameter” directory (→ p. 74, Fig. 51) and assign the “Scattered light intensity” measured variable to one of the three analog outputs available.
- ► Estimate the measuring range required for the dust concentration in operational state and enter this in the “Analog output 1 *(2/3)* Scaling” field assigned to the selected analog output assigned to the scattered light intensity.
- ► Deactivate “Maintenance” mode.
- ► Carry out the gravimetric comparison measurement in accordance with DIN EN 13284-1.
- ► Determine regression coefficients from the mA values of the analog output for “Scattered light intensity” and the actual dust concentrations measured gravimetrically.

$$c = K2 \cdot I_{out}^{\,2} + K1 \cdot I_{out} + K0 \qquad (1)$$

c:	Dust concentration in mg/m³
K2, K1, K0:	Regression coefficients of the function $c = f(I_{out})$
I_{out}:	Current output value in mA

$$I_{out} = LZ + SL \cdot \frac{20mA - LZ}{MBE} \qquad (2)$$

SL:	Measured scattered light intensity
LZ:	Live Zero
MBE:	Defined upper range limit value (value entered for 20 mA; normally 2.5 x fixed limit value)

Subject to change without notice

► Enter the regression coefficients

There are two options:

– Direct input of K2, K1, K0 in a measured value computer.

> ***NOTICE:***
> In this case, the regression coefficients set in the sender/receiver unit and the measuring range set in the MCU may not be changed anymore. On the optional LC Display (when used), the dust concentration is displayed as uncalibrated value in mg/m³.

– Use of the regression function of the measuring system (use without measured value computer).

In this case, the correlation to the scattered light intensity has to be determined. To do this, calculate the regression coefficients cc2, cc1, cc0 to be entered in the measuring system from K2, K1, K0.

$$c = cc2 \cdot SL^2 + cc1 \cdot SL + cc0 \qquad (3)$$

Using (2) in (1), the result is:

$$c = K2 \cdot \left(LZ + SL \cdot \frac{20mA - LZ}{MBE}\right)^2 + K1 \cdot \left(LZ + SL \cdot \frac{20mA - LZ}{MBE}\right) + K0$$

Using (3), the result is:

$$cc0 = K2 \cdot LZ^2 + K1 \cdot LZ + K0$$

$$cc1 = (2 \cdot K2 \cdot LZ + K1) \cdot \left(\frac{20mA - LZ}{MBE}\right)$$

$$cc2 = K2 \cdot \left(\frac{20mA - LZ}{MBE}\right)^2$$

Now enter the regression coefficients cc2, cc1 and cc0 determined in directory “Configuration/Application parameters” (→ p. 79, Fig. 54→ p. 80, Fig. 4.3.9) (set sender/receiver unit to “Maintenance” state and enter the level 1 password; reset the sender/receiver unit back to “Measurement” state afterwards).

> This method allows changing the parameters for the selected measuring range as desired.

Subject to change without notice

4.3.10 Data backup

All parameters relevant for recording, processing and input/output of measured values as well as current measured values can be saved and printed. This allows easy reentering of set device parameters as needed or registering device data and states for diagnostic purposes.

The following options are available:

- Saving as a project
  Not only device parameters but also data logs can be saved.
- Saving as a device file
  Saved parameters can be processed without a device connected and transferred to the device again later.

See the Service Manual for a description.

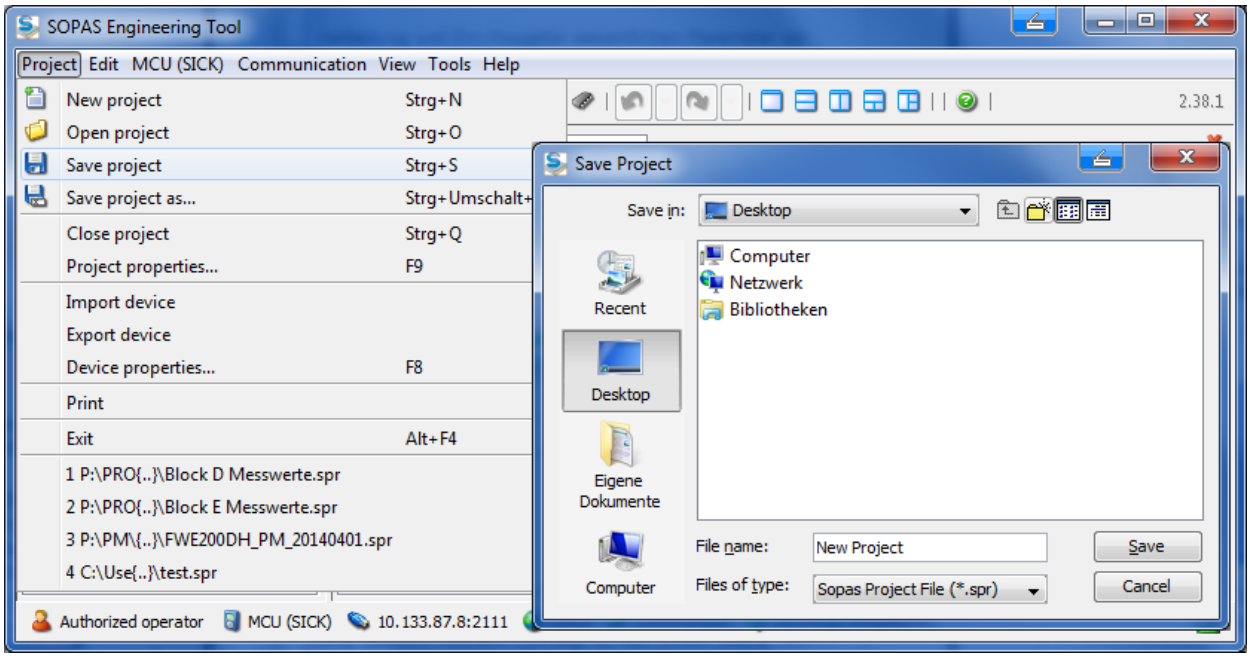
- Saving as a protocol
  Device data and parameters are registered in the Parameter protocol.
  A Diagnosis protocol can be created for analysis of the device function and recognition of possible malfunctions.

Saving as a project

It is recommended to store a “project” for frequent connections. It is then only necessary to open this “project” to connect to the device. All data saved beforehand are then transferred automatically to SOPAS ET.

To save, select the “Project / Export Device” menu and then define the target directory and file name. The name of the file to be stored can be chosen freely. It is useful to specify a name with a reference to the sampling point involved (name of the company, equipment name).

Fig 55 Menu “Project / Save Project”

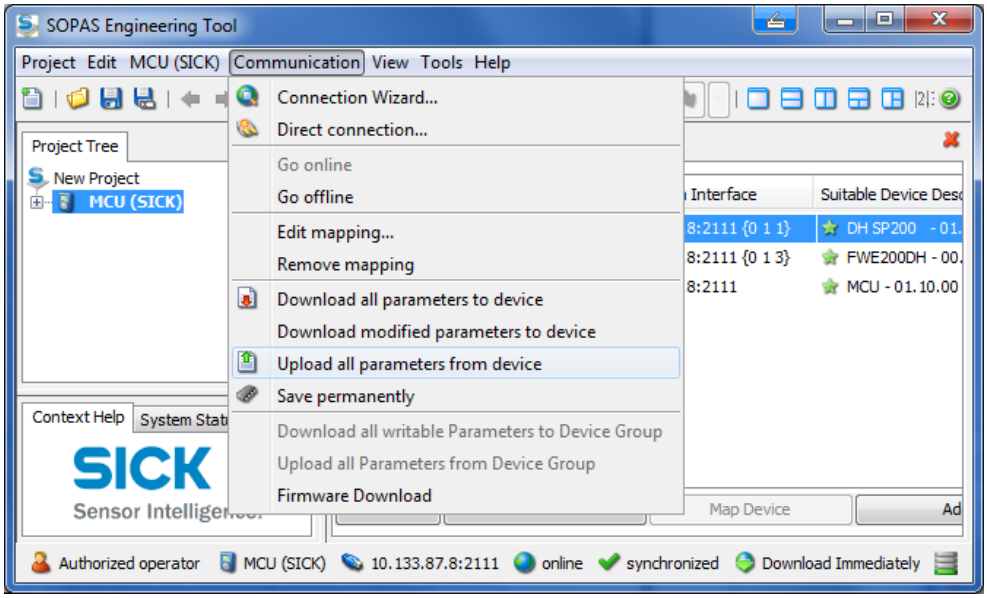


Subject to change without notice

Saving as a protocol

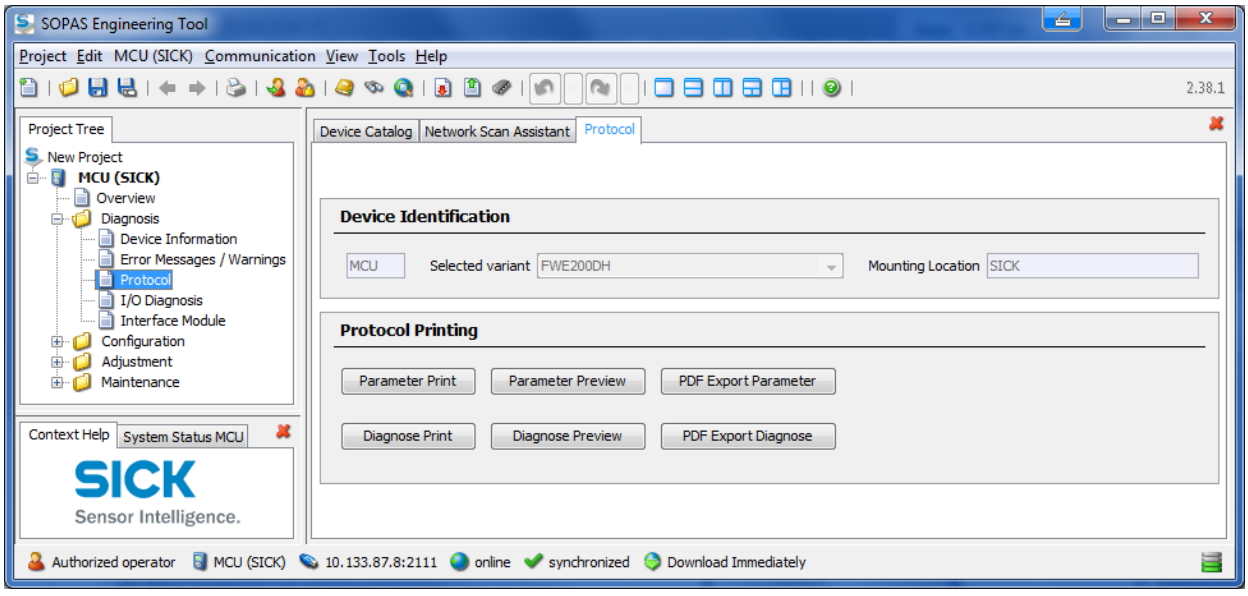
► Select “Communication / Upload all parameters from device” in the menu to select the device and update device data.

Fig 56 Update device data (example)



► Select the “Diagnosis / Protocol” directory and click the button for the desired type of registration.

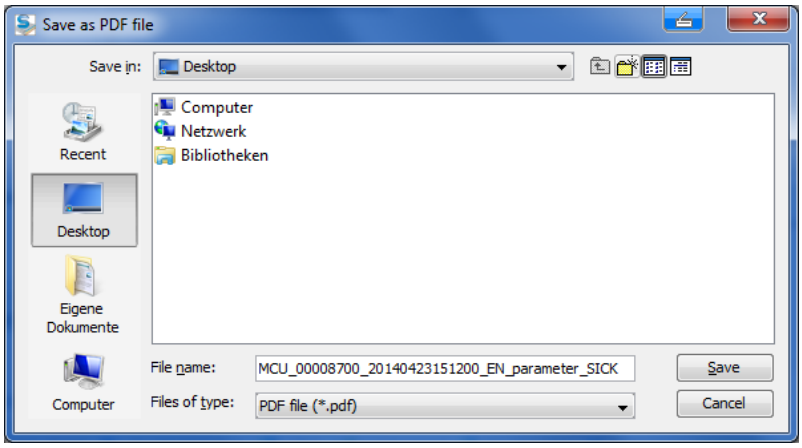
Fig 57 Directory “Diagnosis / Protocol” (example)



Subject to change without notice

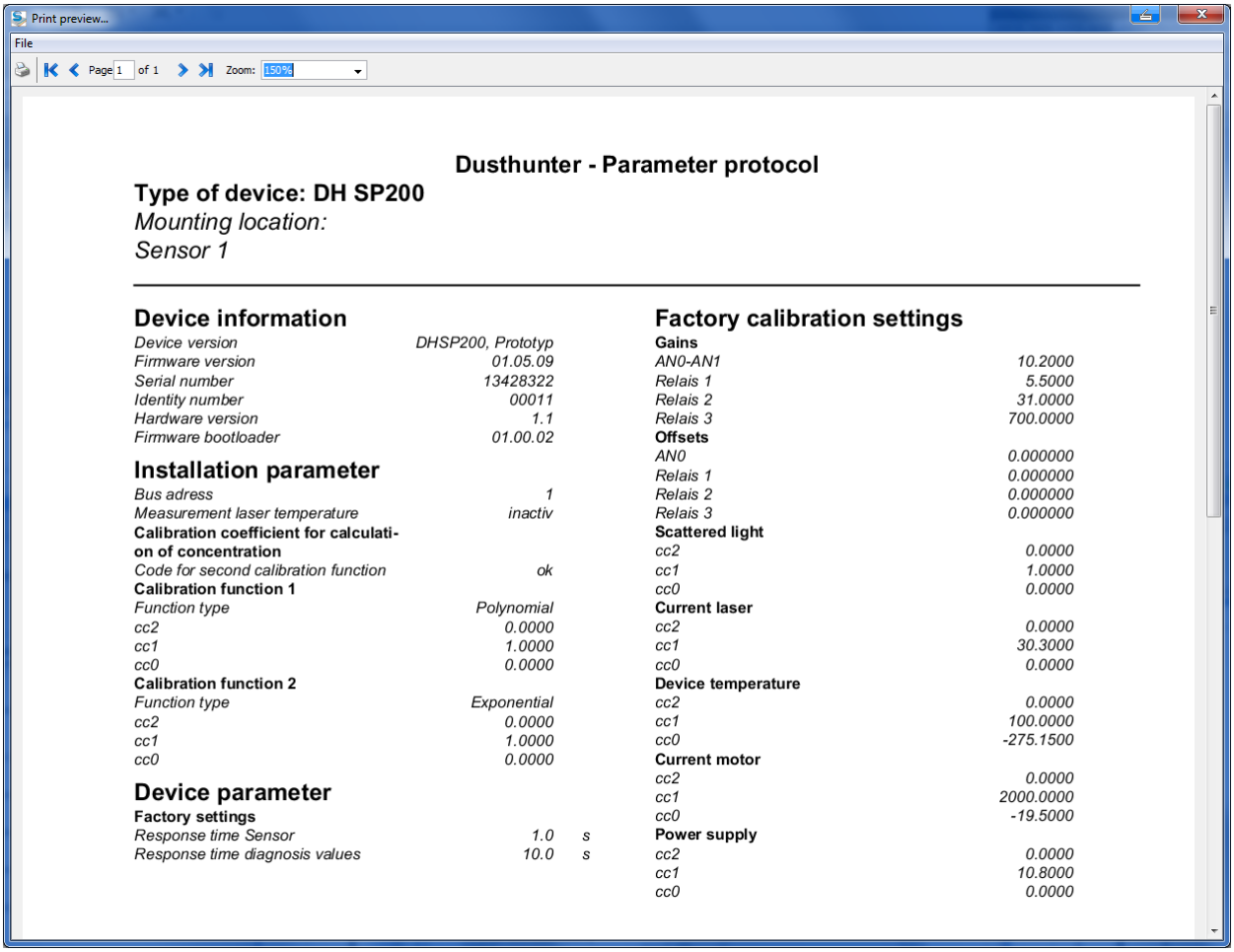
The file name and storage location must be specified for export to a PDF file.

Fig 58 Specifying file name and storage location



Parameter protocol example

Fig 59 Parameter protocol DH SP200 (example)



Print preview...

File

Page 1 of 1 Zoom: 150%

Dusthunter - Parameter protocol

Type of device: DH SP200

Mounting location:
Sensor 1

Device information

Device version	*DHSP200, Prototyp*
Firmware version	*01.05.09*
Serial number	*13428322*
Identity number	*00011*
Hardware version	*1.1*
Firmware bootloader	*01.00.02*

Installation parameter

Bus adress	*1*
Measurement laser temperature	*inactiv*
Calibration coefficient for calculation of concentration	
Code for second calibration function	*ok*
Calibration function 1	
Function type	*Polynomial*
cc2	*0.0000*
cc1	*1.0000*
cc0	*0.0000*
Calibration function 2	
Function type	*Exponential*
cc2	*0.0000*
cc1	*1.0000*
cc0	*0.0000*

Device parameter

Factory settings

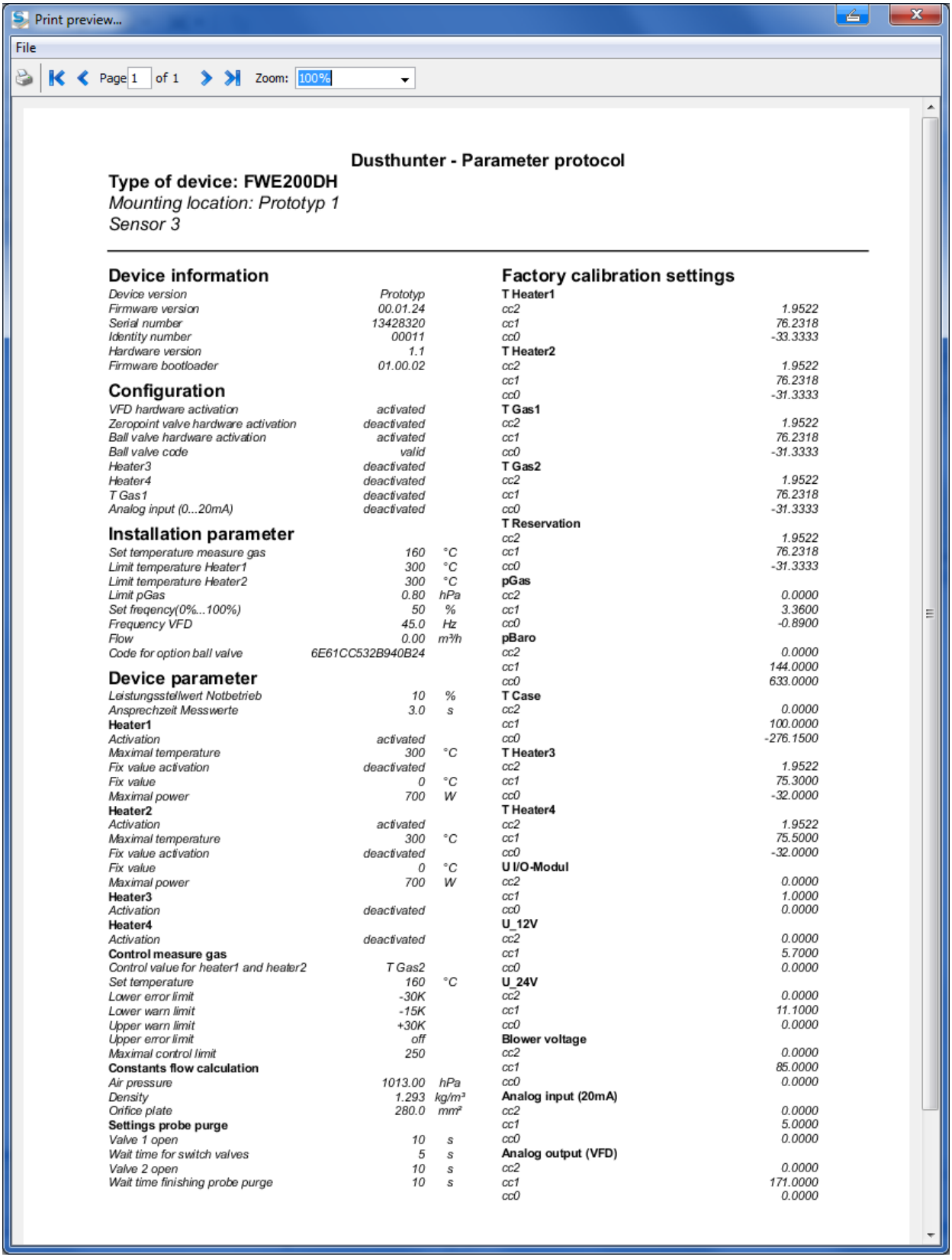
Response time Sensor	*1.0*	*s*
Response time diagnosis values	*10.0*	*s*

Factory calibration settings

Gains	
AN0-AN1	*10.2000*
Relais 1	*5.5000*
Relais 2	*31.0000*
Relais 3	*700.0000*
Offsets	
AN0	*0.000000*
Relais 1	*0.000000*
Relais 2	*0.000000*
Relais 3	*0.000000*
Scattered light	
cc2	*0.0000*
cc1	*1.0000*
cc0	*0.0000*
Current laser	
cc2	*0.0000*
cc1	*30.3000*
cc0	*0.0000*
Device temperature	
cc2	*0.0000*
cc1	*100.0000*
cc0	*-275.1500*
Current motor	
cc2	*0.0000*
cc1	*2000.0000*
cc0	*-19.5000*
Power supply	
cc2	*0.0000*
cc1	*10.8000*
cc0	*0.0000*

Subject to change without notice

Fig 60 Parameter protocol FWE200DH (example)



Print preview...

File

Page 1 of 1 Zoom: 100%

Dusthunter - Parameter protocol

Type of device: FWE200DH

Mounting location: Prototyp 1

Sensor 3

Device information

Device version	Prototyp
Firmware version	00.01.24
Serial number	13428320
Identity number	00011
Hardware version	1.1
Firmware bootloader	01.00.02

Configuration

VFD hardware activation	activated
Zeropoint valve hardware activation	deactivated
Ball valve hardware activation	activated
Ball valve code	valid
Heater3	deactivated
Heater4	deactivated
T Gas1	deactivated
Analog input (0...20mA)	deactivated

Installation parameter

Set temperature measure gas	160	°C
Limit temperature Heater1	300	°C
Limit temperature Heater2	300	°C
Limit pGas	0.80	hPa
Set freqency(0%...100%)	50	%
Frequency VFD	45.0	Hz
Flow	0.00	m³/h
Code for option ball valve	6E61CC532B940B24	

Device parameter

Leistungsstellwert Notbetrieb	10	%
Ansprechzeit Messwerte	3.0	s
Heater1		
Activation	activated	
Maximal temperature	300	°C
Fix value activation	deactivated	
Fix value	0	°C
Maximal power	700	W
Heater2		
Activation	activated	
Maximal temperature	300	°C
Fix value activation	deactivated	
Fix value	0	°C
Maximal power	700	W
Heater3		
Activation	deactivated	
Heater4		
Activation	deactivated	
Control measure gas		
Control value for heater1 and heater2	T Gas2	
Set temperature	160	°C
Lower error limit	-30K	
Lower warn limit	-15K	
Upper warn limit	+30K	
Upper error limit	off	
Maximal control limit	250	
Constants flow calculation		
Air pressure	1013.00	hPa
Density	1.293	kg/m³
Orifice plate	280.0	mm²
Settings probe purge		
Valve 1 open	10	s
Wait time for switch valves	5	s
Valve 2 open	10	s
Wait time finishing probe purge	10	s

Factory calibration settings

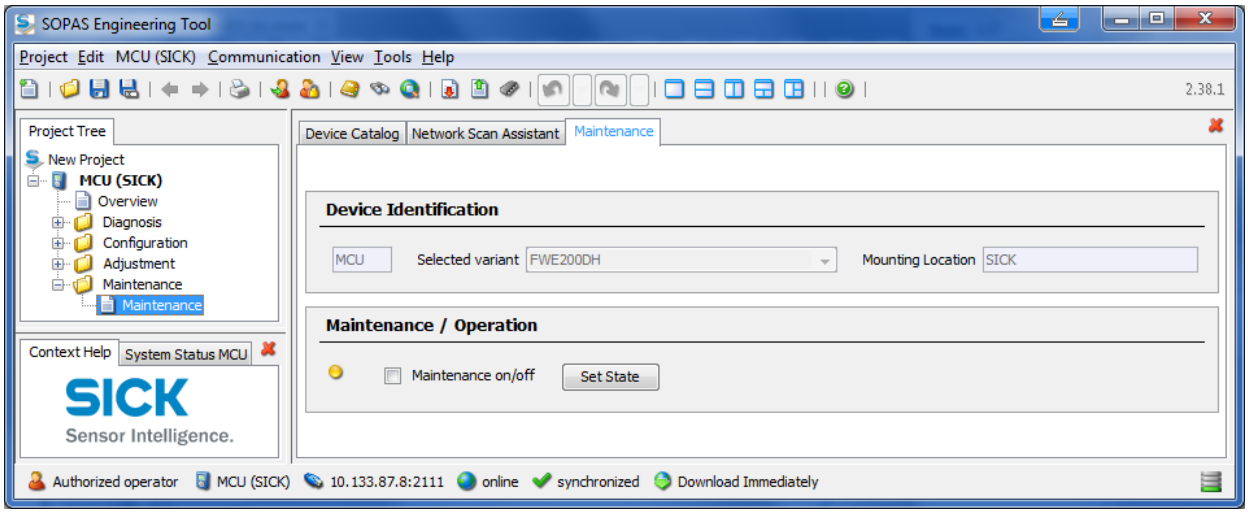
T Heater1	
cc2	1.9522
cc1	76.2318
cc0	-33.3333
T Heater2	
cc2	1.9522
cc1	76.2318
cc0	-31.3333
T Gas1	
cc2	1.9522
cc1	76.2318
cc0	-31.3333
T Gas2	
cc2	1.9522
cc1	76.2318
cc0	-31.3333
T Reservation	
cc2	1.9522
cc1	76.2318
cc0	-31.3333
pGas	
cc2	0.0000
cc1	3.3600
cc0	-0.8900
pBaro	
cc2	0.0000
cc1	144.0000
cc0	633.0000
T Case	
cc2	0.0000
cc1	100.0000
cc0	-276.1500
T Heater3	
cc2	1.9522
cc1	75.3000
cc0	-32.0000
T Heater4	
cc2	1.9522
cc1	75.5000
cc0	-32.0000
U I/O-Modul	
cc2	0.0000
cc1	1.0000
cc0	0.0000
U_12V	
cc2	0.0000
cc1	5.7000
cc0	0.0000
U_24V	
cc2	0.0000
cc1	11.1000
cc0	0.0000
Blower voltage	
cc2	0.0000
cc1	85.0000
cc0	0.0000
Analog input (20mA)	
cc2	0.0000
cc1	5.0000
cc0	0.0000
Analog output (VFD)	
cc2	0.0000
cc1	171.0000
cc0	0.0000

Subject to change without notice

4.3.11 Starting normal measuring operation

Set the measuring system to “Measurement” mode after entering/modifying parameters. To do this, switch to directory “Maintenance / Maintenance”, deactivate the “Maintenance on/off” checkbox in the “Set Operating State” window and click “Set State” (→ Fig. 61). Standard start-up is now completed.

Fig 61 Setting the operational state



Subject to change without notice

4.4 Setting the Interface module parameters

The measuring system is delivered with an Interface module Modbus TCP as standard. When desired, it can be swapped for an Interface module for Profibus DP V0 or Ethernet (type 1) (→ p. 139, §7.3.6).

GSD file and measured value assignment are available for the Profibus DP module on request.

4.4.1 Modbus TCP module

For detailed information concerning communication via Modbus, see the “Modbus Organization” (www.modbus.org) documents, for example:

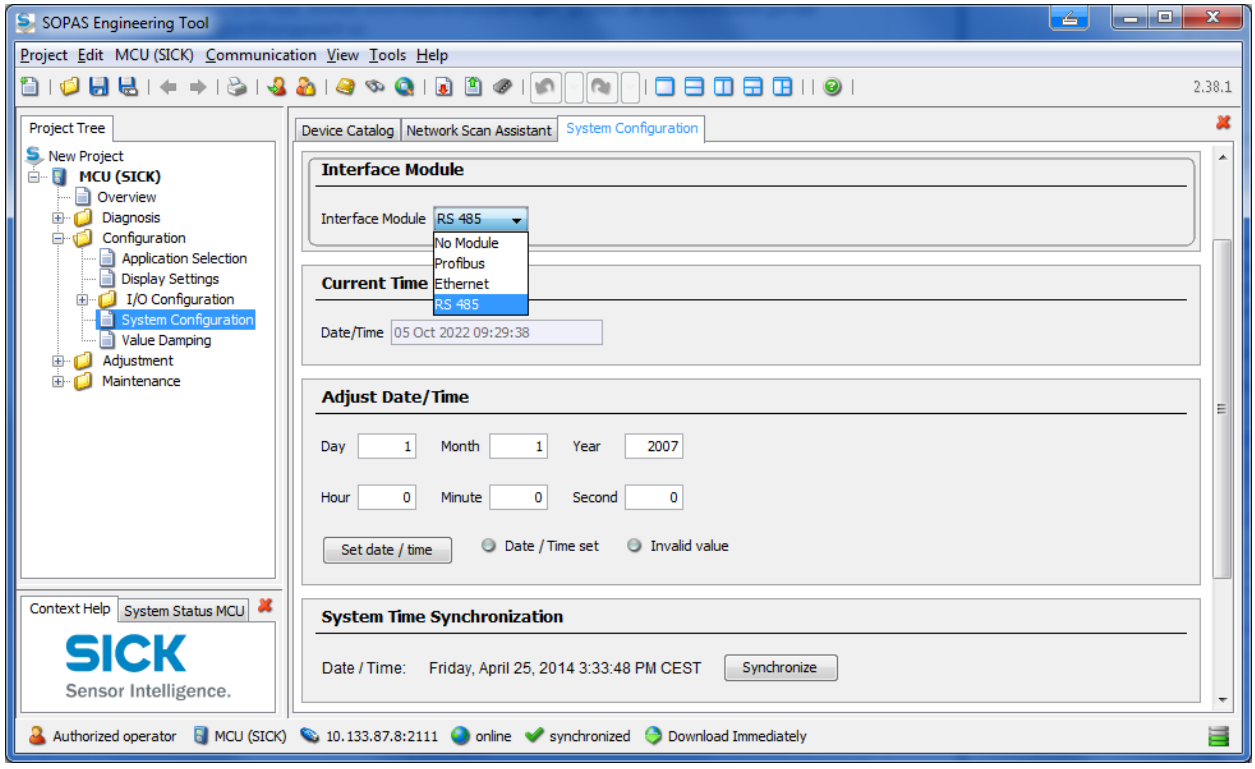
- MODBUS Messaging on TCP/IP Implementation Guide
- MODBUS APPLICATION PROTOCOL SPECIFICATION
- MODBUS over serial line specification and implementation guide

The register assignment is supplied as separate document with the Modbus module.

4.4.1.1 Check MCU settings

- ► Connect the MCU to the SOPAS ET program, select device file “MCU”, enter the level 1 password (→ p. 68, §4.3) and set the measuring system to “Maintenance” mode (→ p. 70, §4.3.2).
- ► Switch to directory “Configuration / System Configuration” and check that the module type in field “Interface Module / Interface Module” is set to “RS485”.

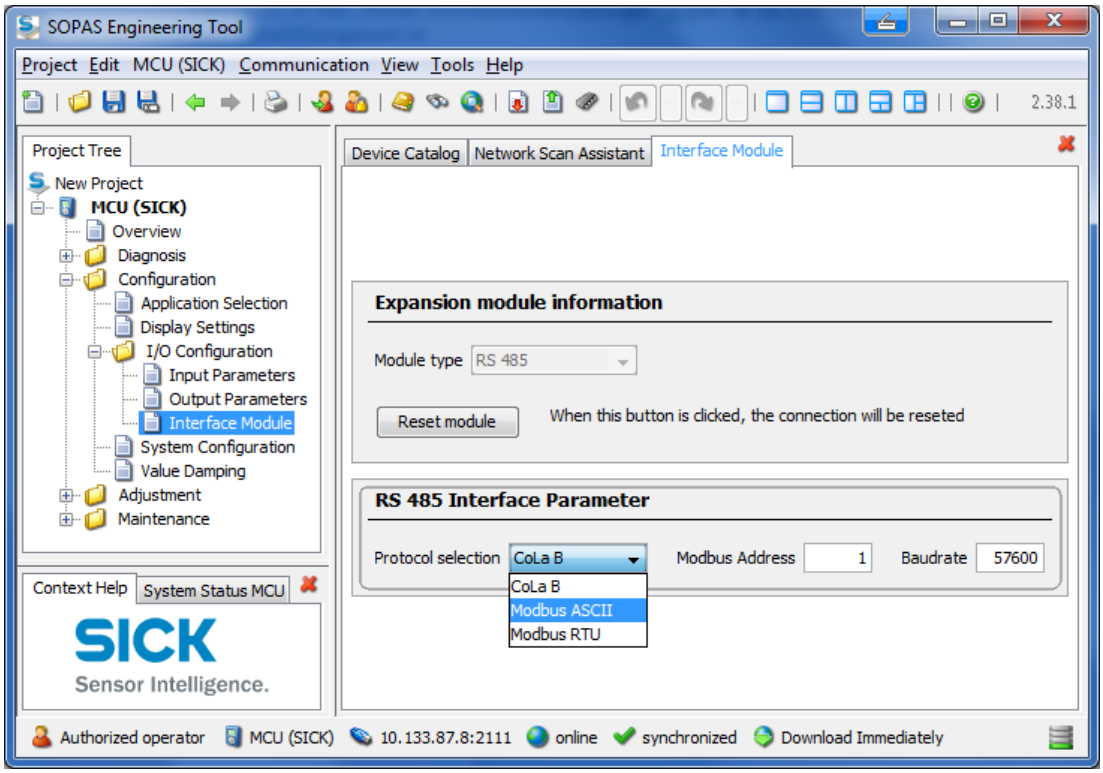
Fig 62 “Configuration / System Configuration” directory



Subject to change without notice

► Switch to directory “Configuration / I/O Configuration / Interface Module” directory and check that the interface is set according to Fig. 63 in the “RS 485 Interface Parameter” field.

Fig 63 Check the interface



Subject to change without notice

4.4.1.2 Installing the configuration program

A separate configuration program must be installed to set the customer requirements.

Administrator rights are required to install software.

System requirements

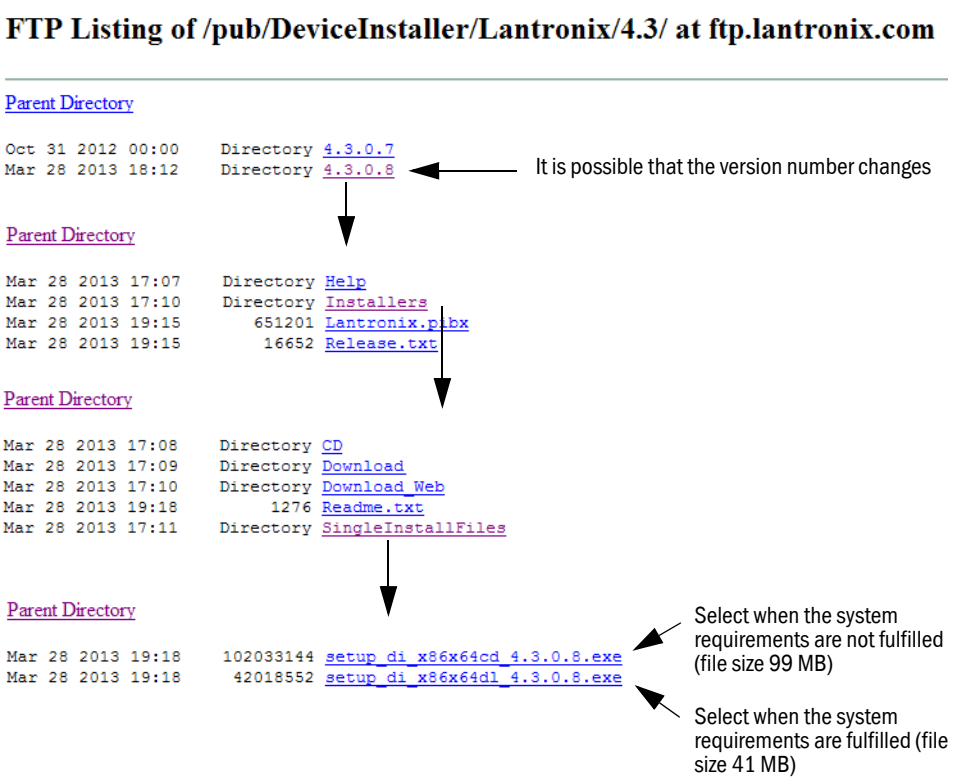
- Operating system: MS-Windows XP or higher
- Program NET Framework 4.0
- Program Windows Installer 3.1

Install the configuration program

► Connect the laptop/PC with the internet and enter “ftp://ftp.lantronix.com/pub/DeviceInstaller/Lantronix/4.3/”.

► Download the current configuration program.

Fig 64 Downloading the configuration program



Subject to change without notice

4.4.1.3 Integrating the Modbus module in the network

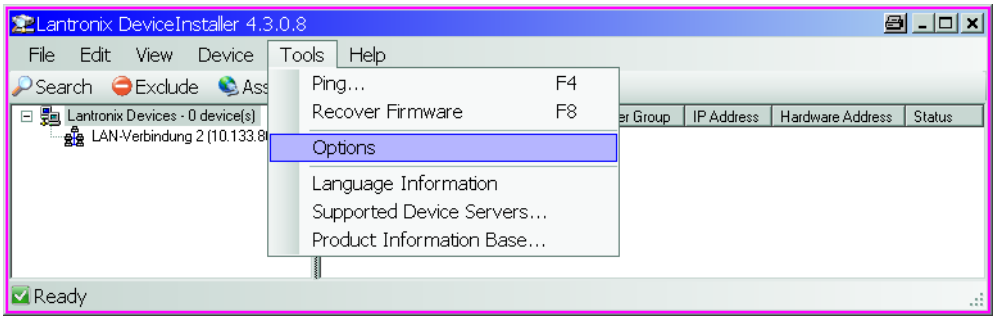
► Start the “DeviceInstaller” program.

Fig 65 Starting the “DeviceInstaller”

► Wait for a few seconds while the program is searching for installed components.

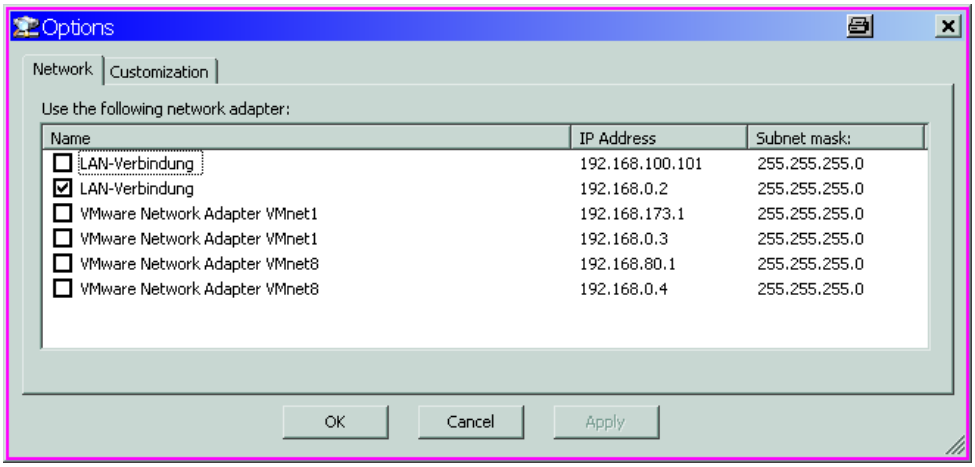
► Select the “Tools/Options” menu.

Fig 66 “Tools/Options” menu



► If several networks are available, select the network interface with which the Modbus module is connected.

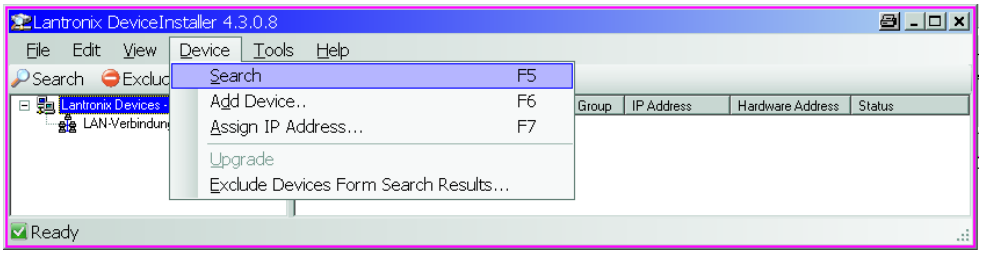
Fig 67 Network connection(s) (example)



Subject to change without notice

► Select the “Device/Search” menu and search for the Modbus module.

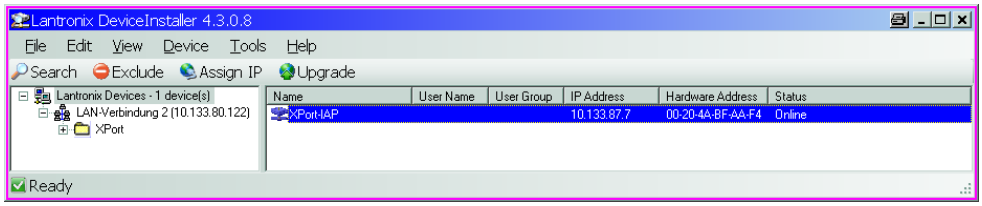
Fig 68 Searching for connected components



If no module has been found, check the network connection and search again.

► Select the found module.

Fig 69 Selecting the module

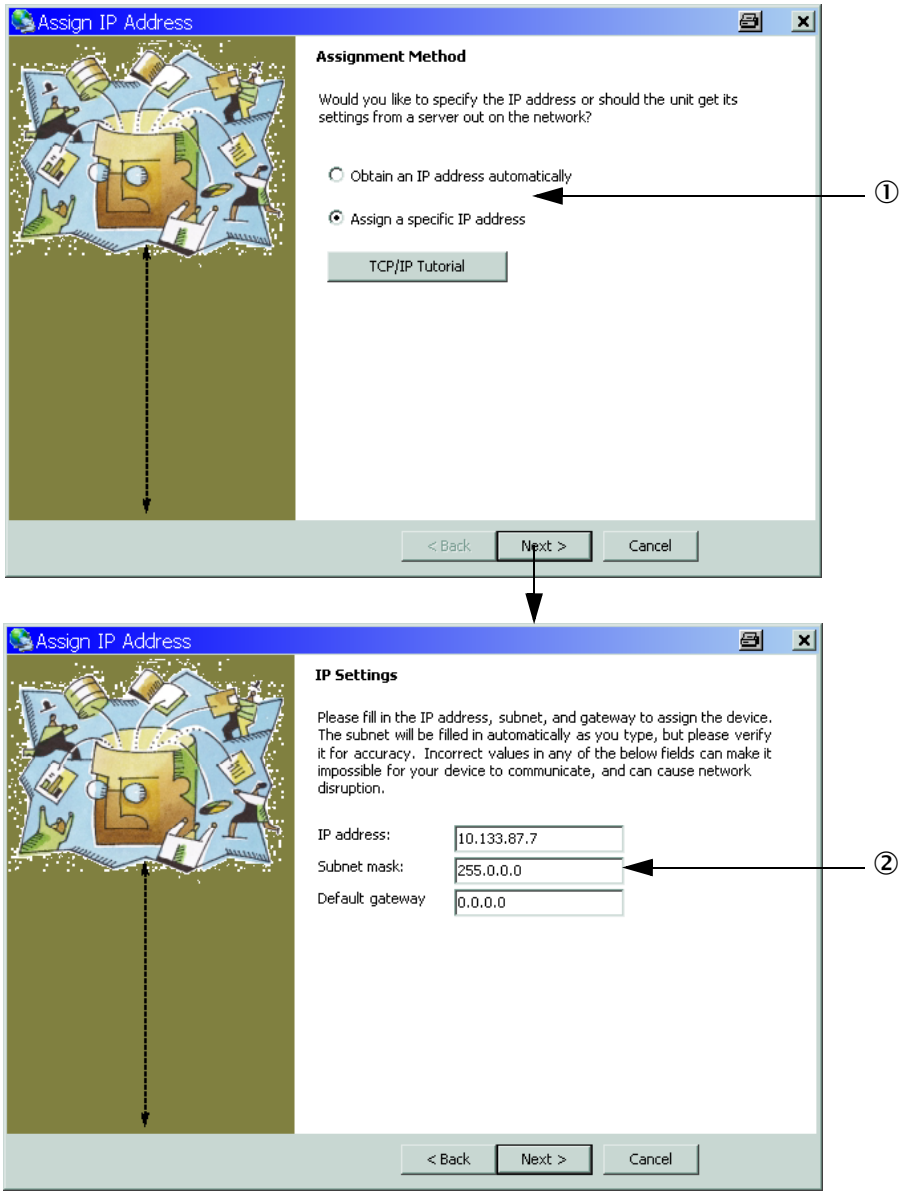


NOTICE:
Select the module only in the right window, not in the tree structure on the left.

Subject to change without notice

► Click the “Assign IP” menu and perform the following steps.

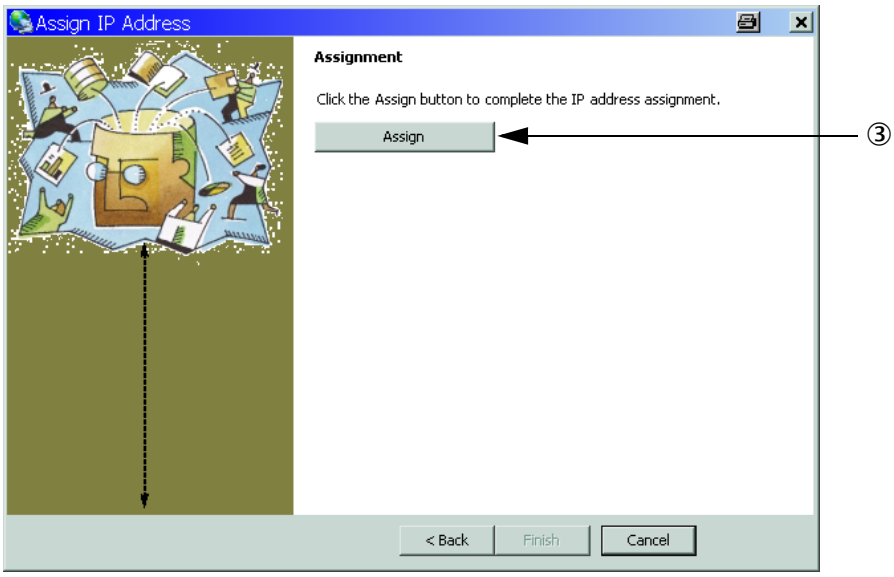
Fig 70 Network assignment (address information is exemplary)



Step	Remark
1	Select the respective setting depending on the desired address assignment (automatic or manual assignment)
2	Manual assignment: Enter the required network connection data here.

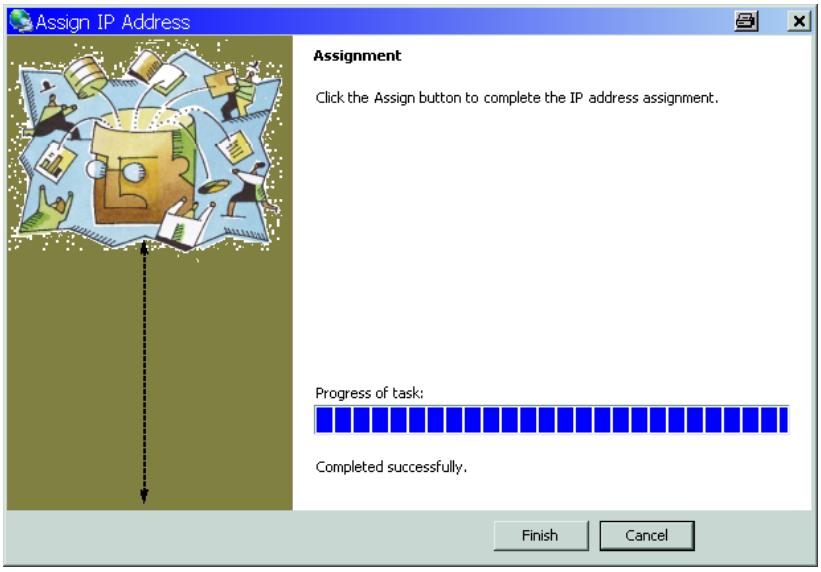
Subject to change without notice

Fig 71 Defining the address settings



► Complete the assignment, then wait while the module is being configured and then click “Finish”.

Fig 72 Completing the assignment

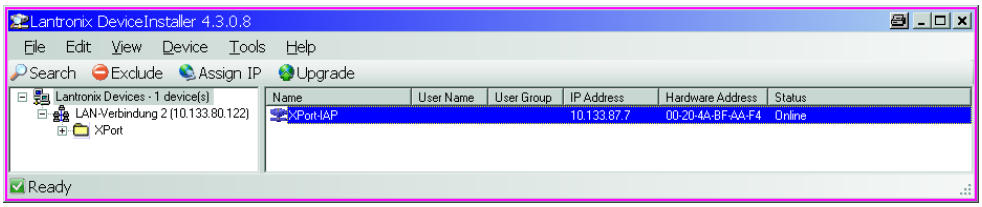


Subject to change without notice

4.4.1.4 Configuring the Modbus module

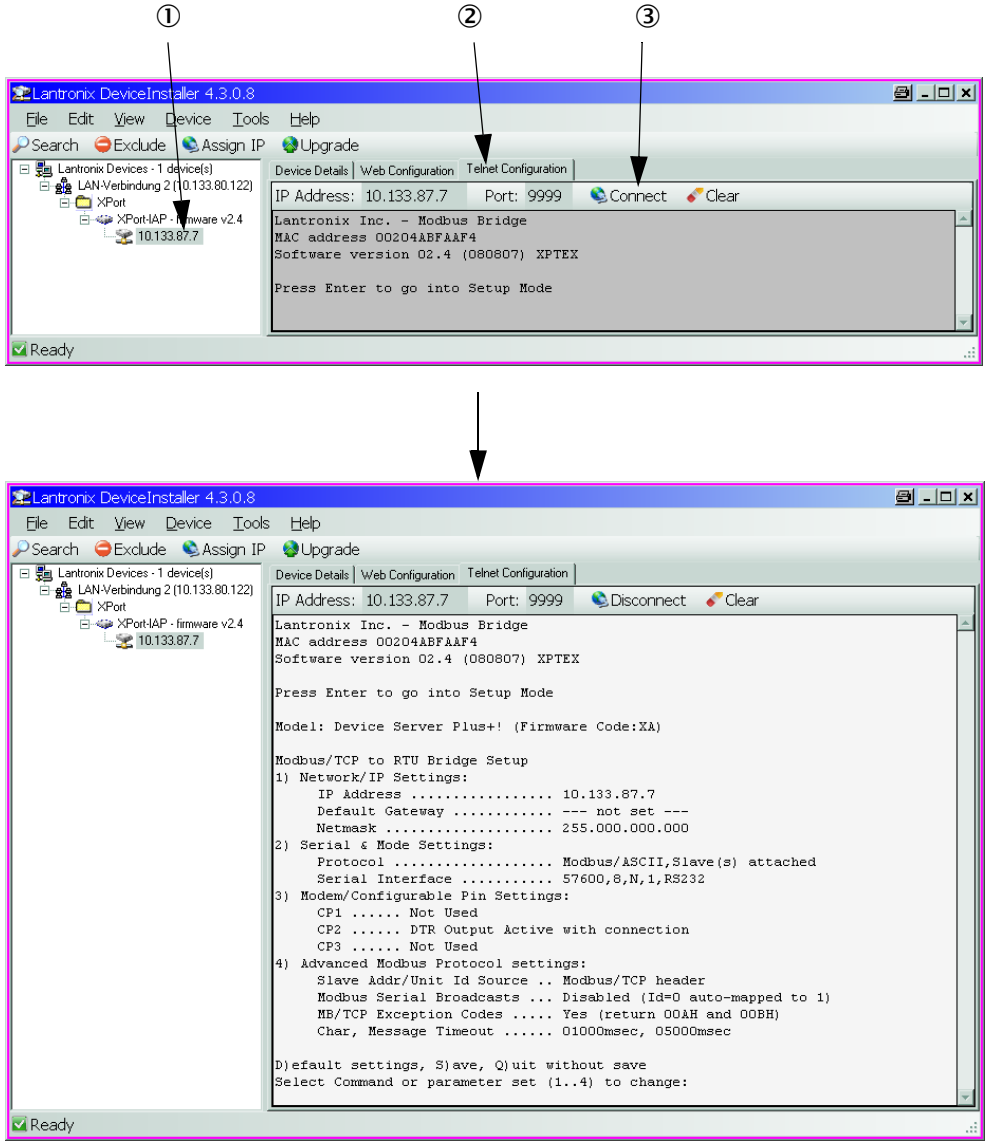
► After confirming the address assignment with “Finish”, the following window is displayed:

Fig 73 “Telnet Configuration”



► Perform steps (1) to (3) in succession and confirm with <Enter>.

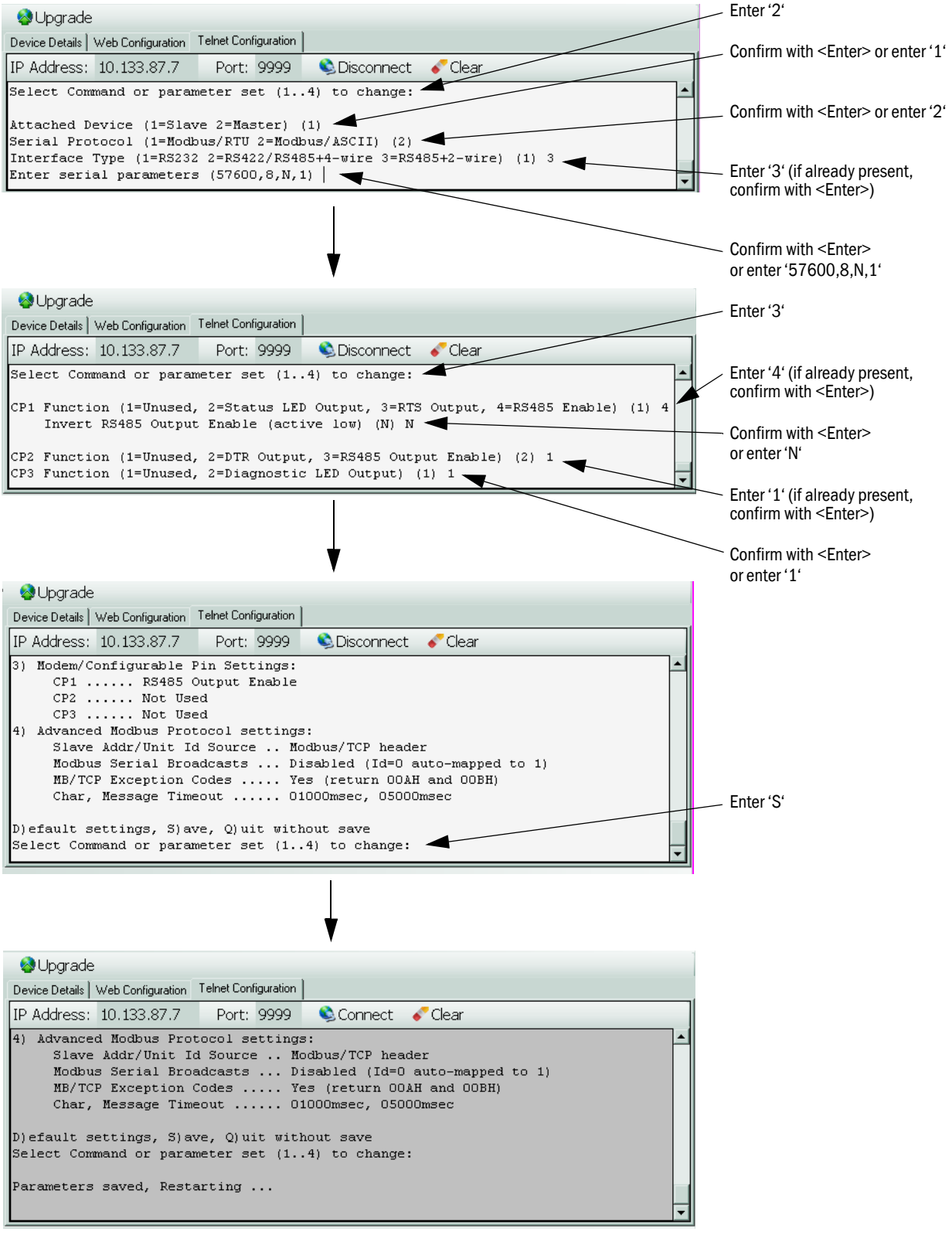
Fig 74 “Telnet Configuration”



Subject to change without notice

► Define the serial and Modbus settings with the following entries.

Fig 75 Serial and Modbus settings



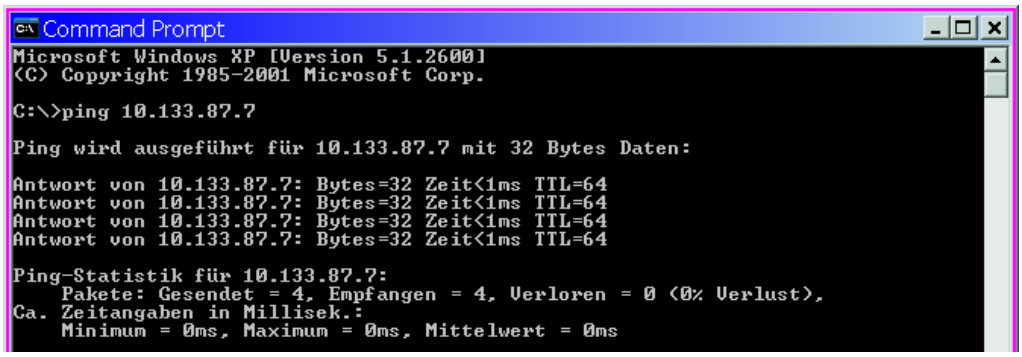
The Modbus module TCP is now configured.

Subject to change without notice

4.4.1.5 **Checking the functional capability**

► Enter 'ping' followed by the IP address under “Command Prompt” (“Start → Programs → Accessories”) and check the module reply.

Fig 76 Correct reply from Modbus module



Subject to change without notice

4.4.2 Setting the Ethernet module parameters

4.4.2.1 General information

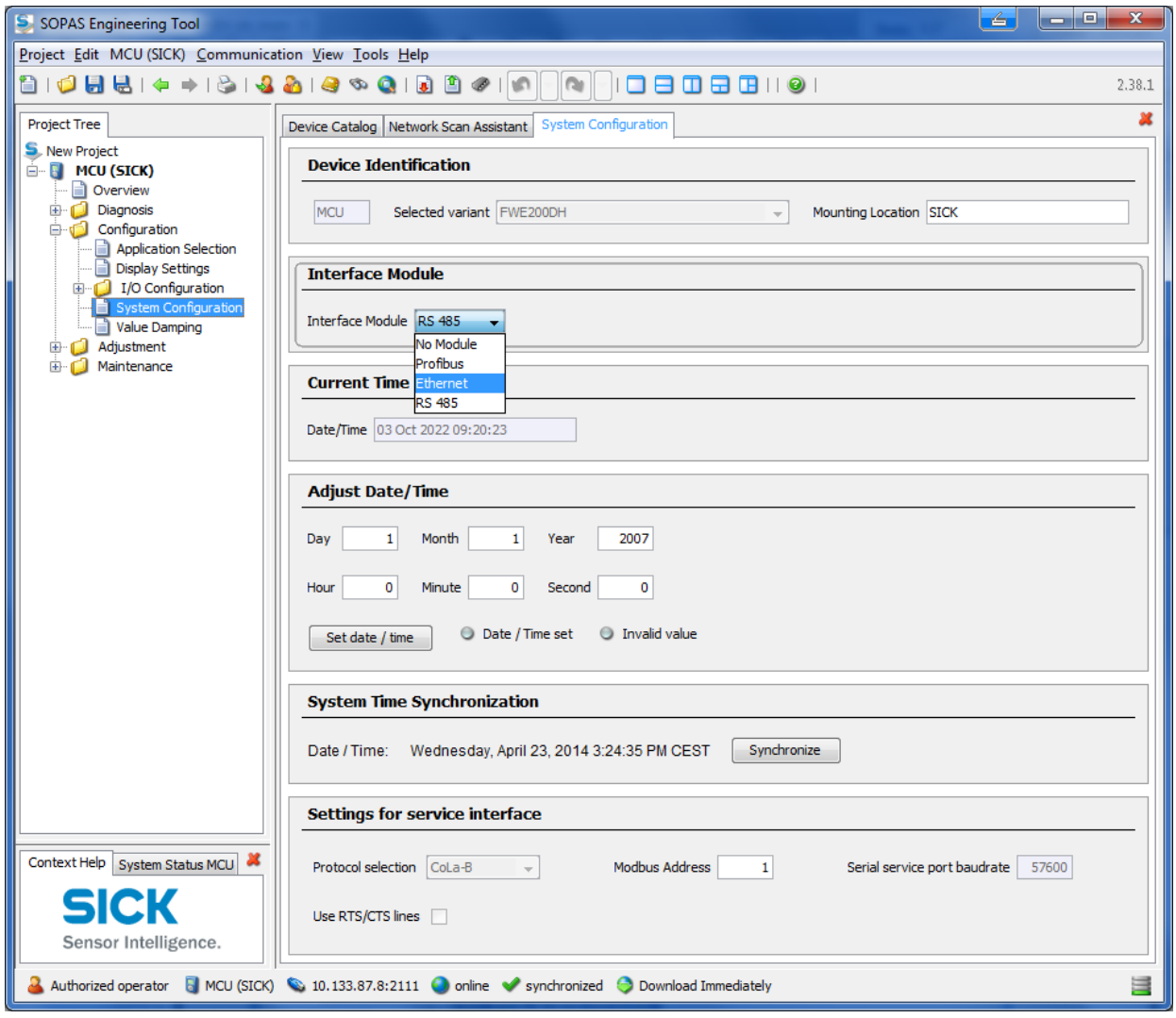
> ***NOTICE:***
> The risk of undesired access to the measuring system is inherent when communicating via Ethernet.
> ► Operate the measuring system only behind suitable protection (e.g., Firewall).

The following steps are necessary to change the Modbus TCP module installed as standard:

► Connect the MCU to the SOPAS ET program, select device file “MCU”, enter the level 1 password (→ p. 68, §4.3) and set the measuring system to “Maintenance” mode (→ p. 70, §4.3.2).

► Switch to directory “Configuration / System Configuration” and select the module type in field “Interface Module” under “Installed Interface Module”.

Fig 77 “Configuration / System Configuration” directory



Subject to change without notice

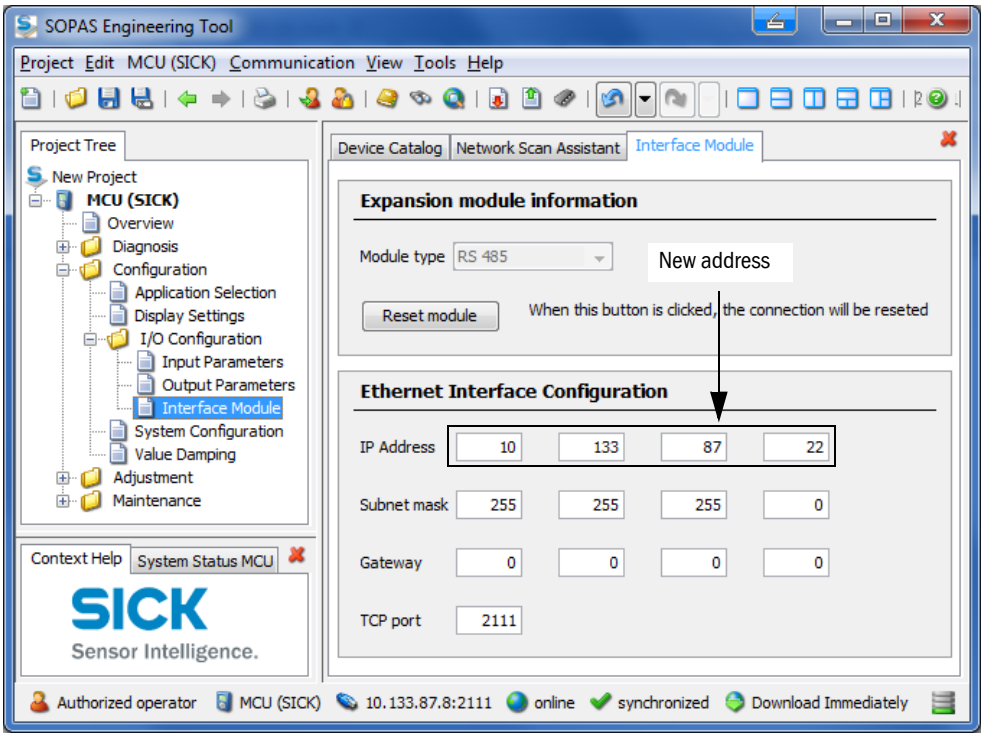
4.4.2.2 Assigning the Ethernet module a new IP address

An IP address specified by the customer is entered at the factory when the address is available when the device is ordered. If not, standard address 192.168.0.10 is set.

The following steps are necessary to change the address:

- ► Select directory “Configuration / I/O Configuration / Interface Module”.
- ► Set the desired network configuration in the “Ethernet Interface Configuration” field and click “Reset module” under “Expansion module information”.

Fig 78 Directory “Configuration / I/O Configuration / Interface Module” (example)

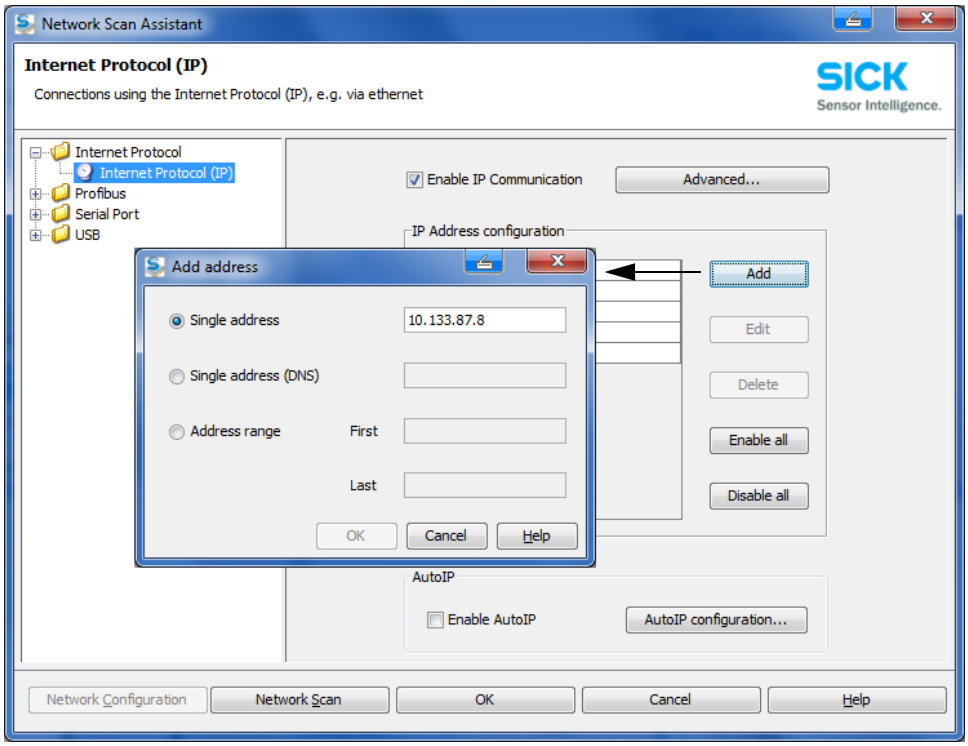


Subject to change without notice

4.4.2.3 Assigning the new IP address to SOPAS ET

- ► Select the “Network Scan Assistant” tab and click “Network Configuration”.
- ► Select the “IP Communication” directory, set the “Enable IP Communication” field to active and click “Add”.
- ► Enter the new IP address set in the “Configuration / I/O Configuration / Interface Module” directory and confirm with “OK”.

Fig 79 Entering the IP address (example)

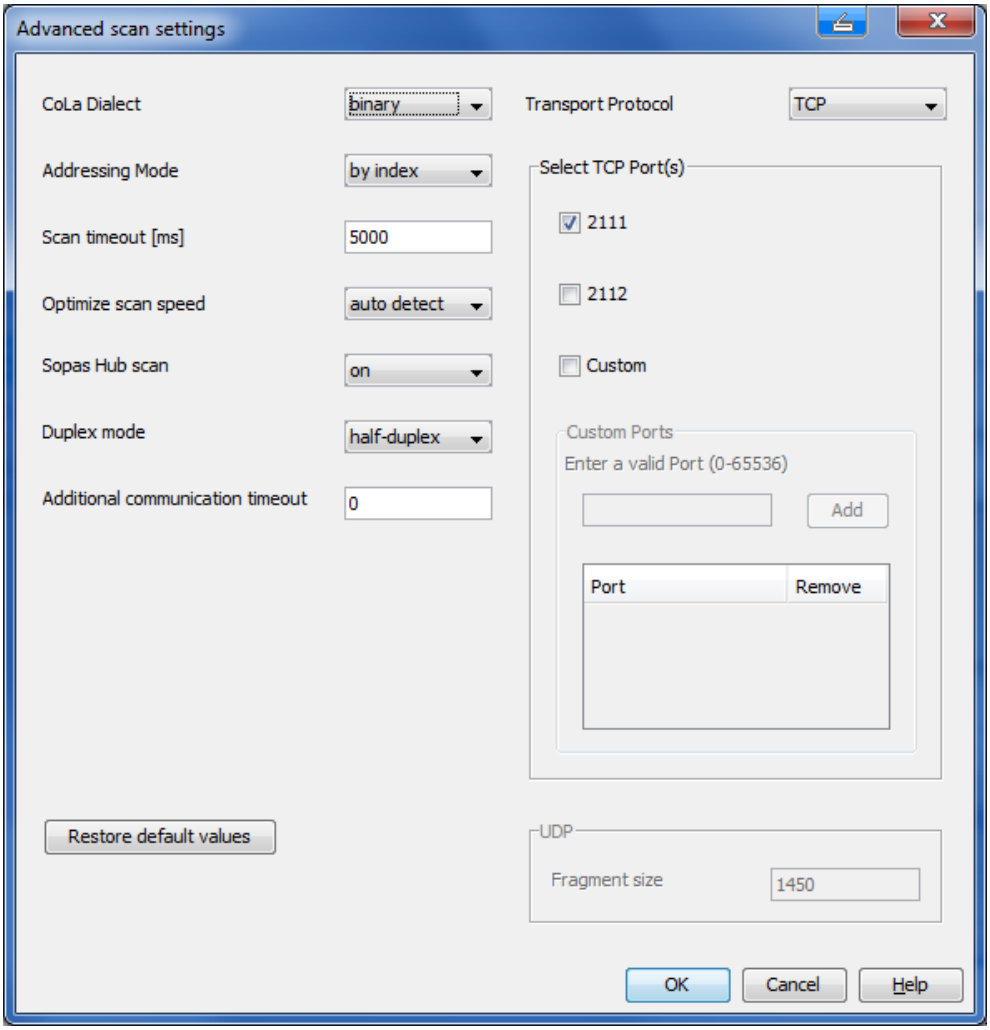


- ► Click “Advanced” in the “IP communication” directory.

Subject to change without notice

► Select port address “2111” and confirm with “OK” (all other settings and values according to Fig. 80).

Fig 80 Specifying the TCP port

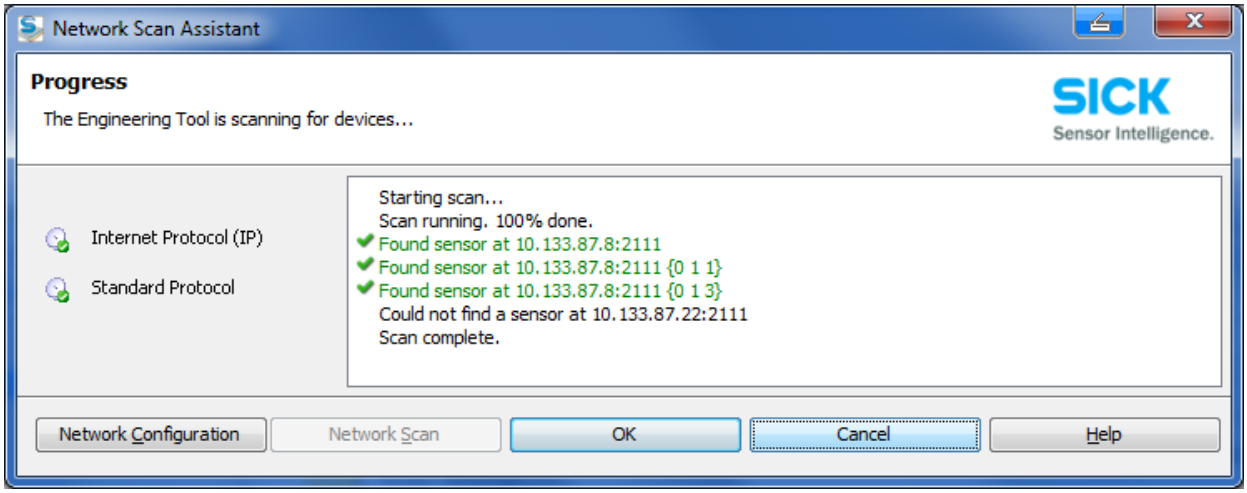


► Activate only the required TCP port.
► To use a TCP port other than 2111 or 2112, activate the “Custom” checkbox and enter the port number in the field below.

► Select the “Network Scan Assistant” tab, click “Network Scan” and check that the set address is displayed.

Subject to change without notice

Fig 81 Network scanning



NOTICE:

Malfunctions in data transfers not caused by the measuring system can occur during communication via Ethernet.

- ► The FWE200DH manufacturer assumes no responsibility for malfunctions that may occur during equipment operation when measured value transfers and their usage to control processes run solely via Ethernet.

Increasing the value in the “Scan timeout” field from 500 ms to 3000 ms can minimize communication problems.

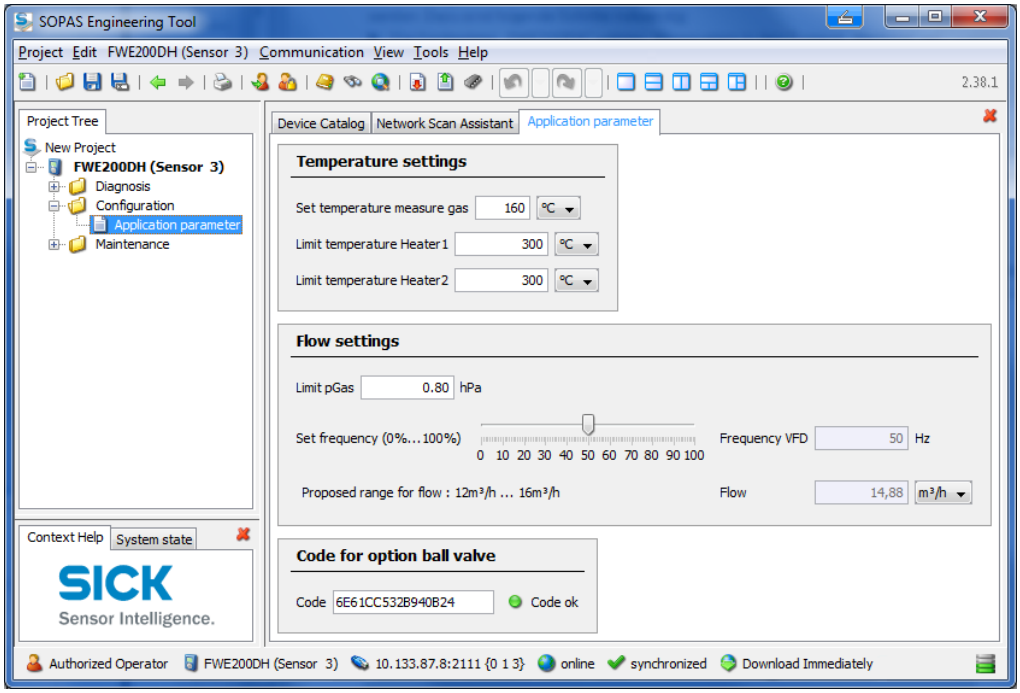
Subject to change without notice

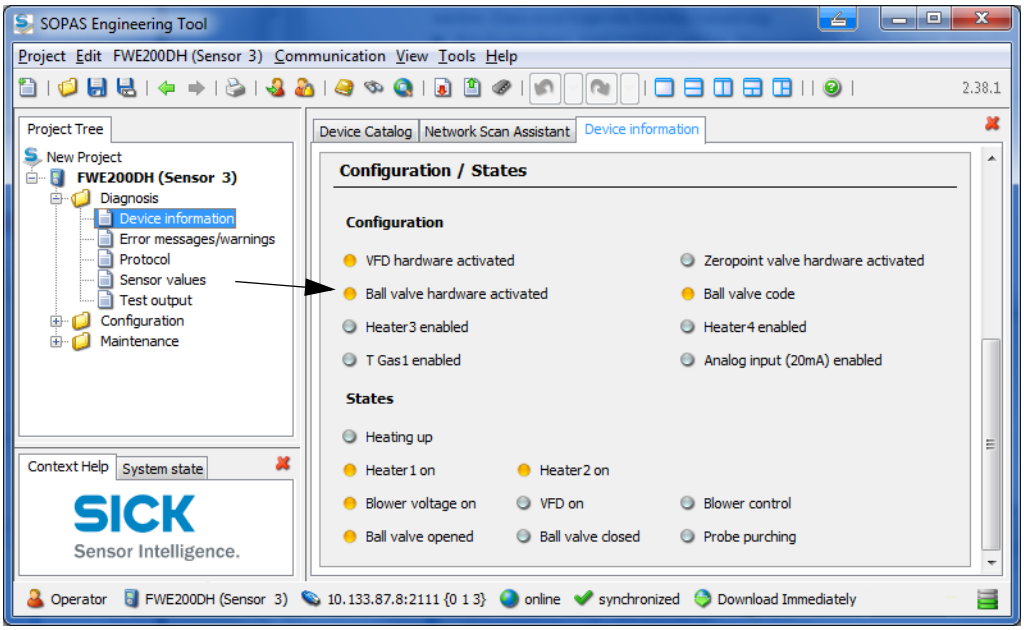
4.5 Activating the backpurge option

This option must be activated with a codeword when retrofitted. The following steps are then required:

- ► Select the “FWE200DH” device file, set the measuring system to “Maintenance” mode and enter the level 1 password (→ p. 67, §4.2.4).
- ► Enter the codeword provided in field “Code for option ball valve” in directory “Configuration / Application parameter”.
- ► Switch to directory “Diagnosis / Device information” and check that display “Ball valve hardware activated” is active in field “Configuration / States” (if not, activate according to → p. 47, §3.3.4).

Fig 82 Activating the backpurge option (example)





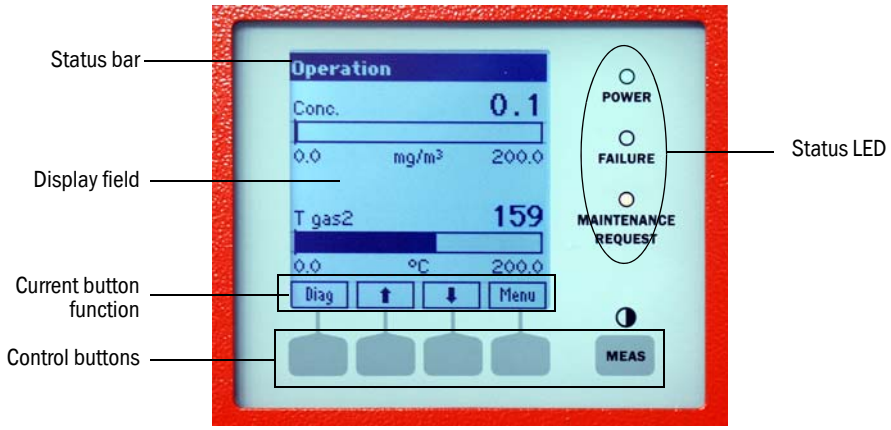
Subject to change without notice

4.6 Operating/setting parameters via the LC-Display

4.6.1 General information on use

The display and operating interface of the LC-Display contains the functional elements shown in Fig. 83.

Fig 83 LC-Display functional elements



Button functions

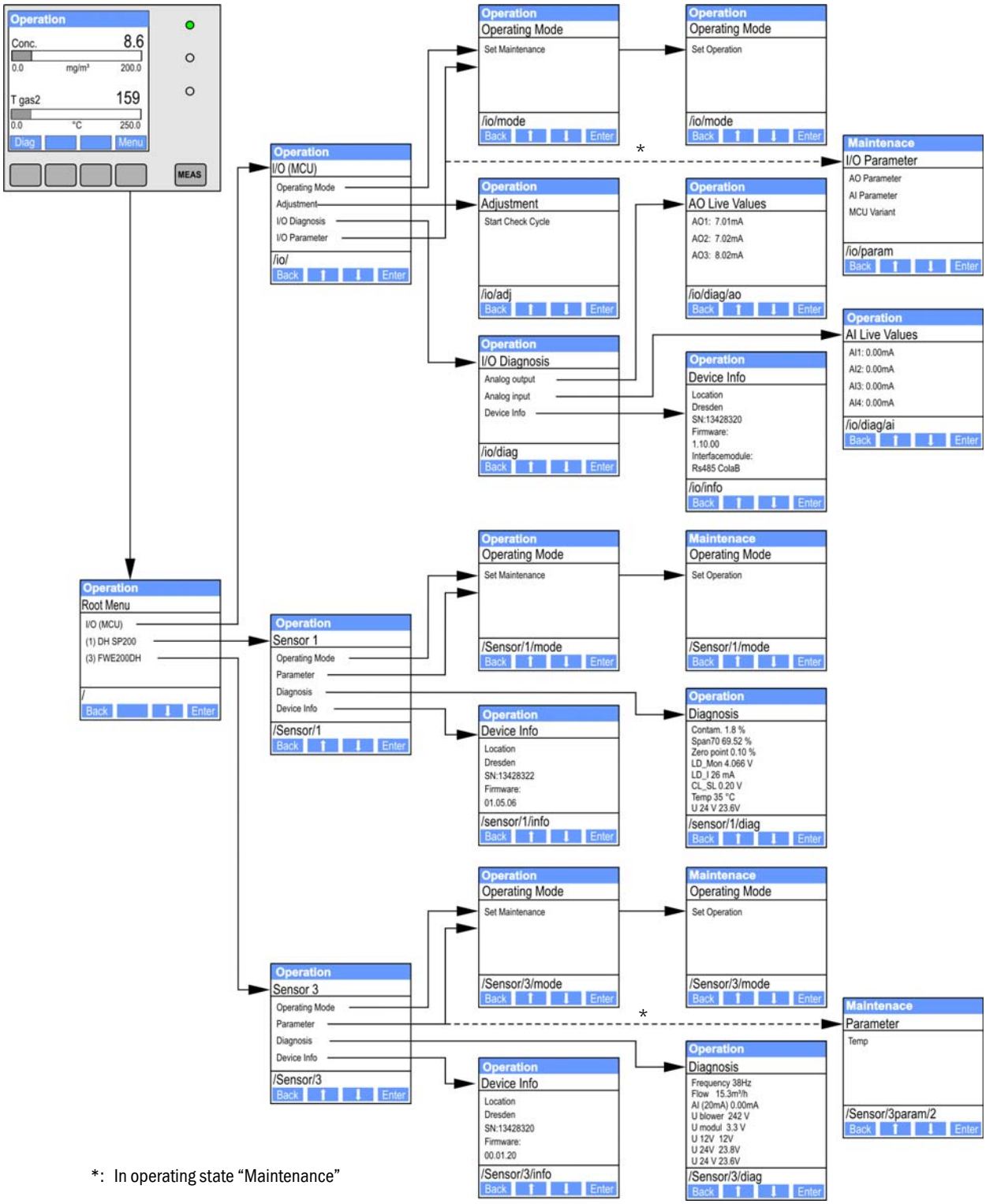
The function shown depends on the Menu currently selected. Only the function shown in the button is available.

Button	Function
Diag	Display diagnostic information (warnings and errors during a start using the Main menu, sensor information during a start using the Diagnostics menu → p. 104, Fig. 84)
Back	Switch to higher level menu
Arrow ⇑	Scroll up
Arrow ⇓	Scroll down
Enter	Execution of the action selected with an arrow button (switch to a submenu, confirm parameter selected during parameter setting)
Start	Start an action
Save	Store a changed parameter
Meas	Toggle between text and graphic display Display the contrast setting (after 2.5 s)

Subject to change without notice

4.6.2 Menu structure

Fig 84 LC-Display menu structure



*: In operating state “Maintenance”

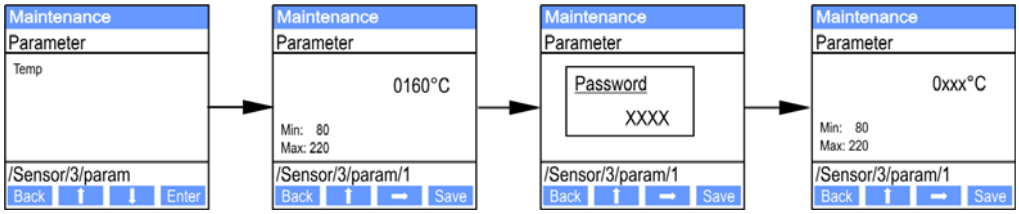
Subject to change without notice

4.6.3 Setting parameters

4.6.3.1 Sample gas temperature

- ► Set the system control (FWE200DH) to “Maintenance” (→ p. 104, Fig. 84) and activate submenu “Parameter”.
- ► Choose the parameter to be entered and enter the default password “1234”.
- ► Set the calculated coefficients (→ p. 68, §4.3) using the “^” and/or “→” buttons and write to the device with “Save” (confirm twice).

Fig 85 Changing the sample gas temperature

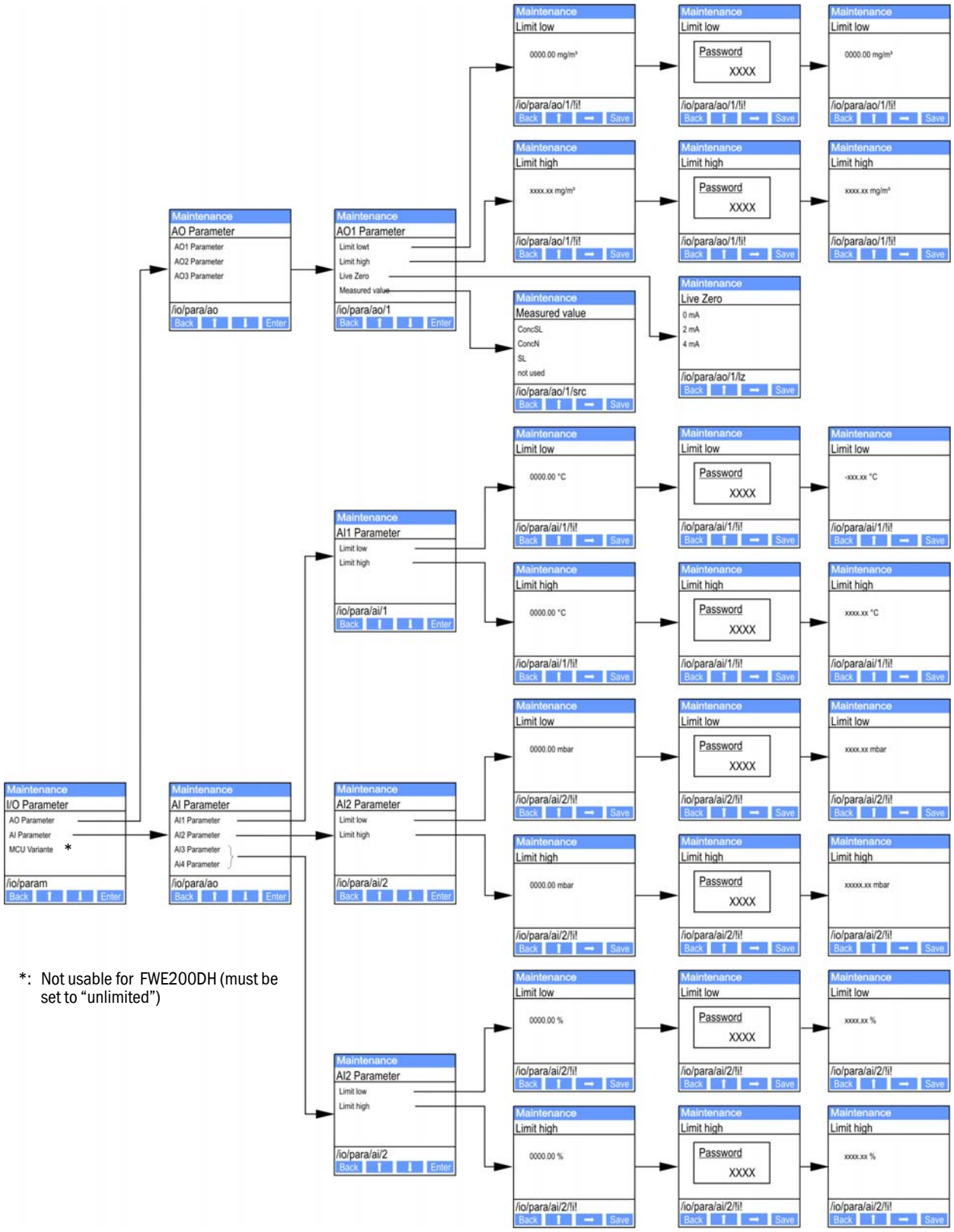


4.6.3.2 Analog outputs / inputs

- ► Set the control unit (MCU) to “Maintenance” (→ p. 104, Fig. 84) and activate submenu “I/O Parameter”.
- ► Select the desired parameter and enter the default password “1234” using the “^” (scrolls from 0 to 9) and/or “→” (moves the cursor to the right) buttons.
- ► Select the desired value using the “^” and/or “→” buttons and write it to the device with “Save” (confirm 2x).

Subject to change without notice

Fig 86 Menu structure for configuring analog outputs/inputs



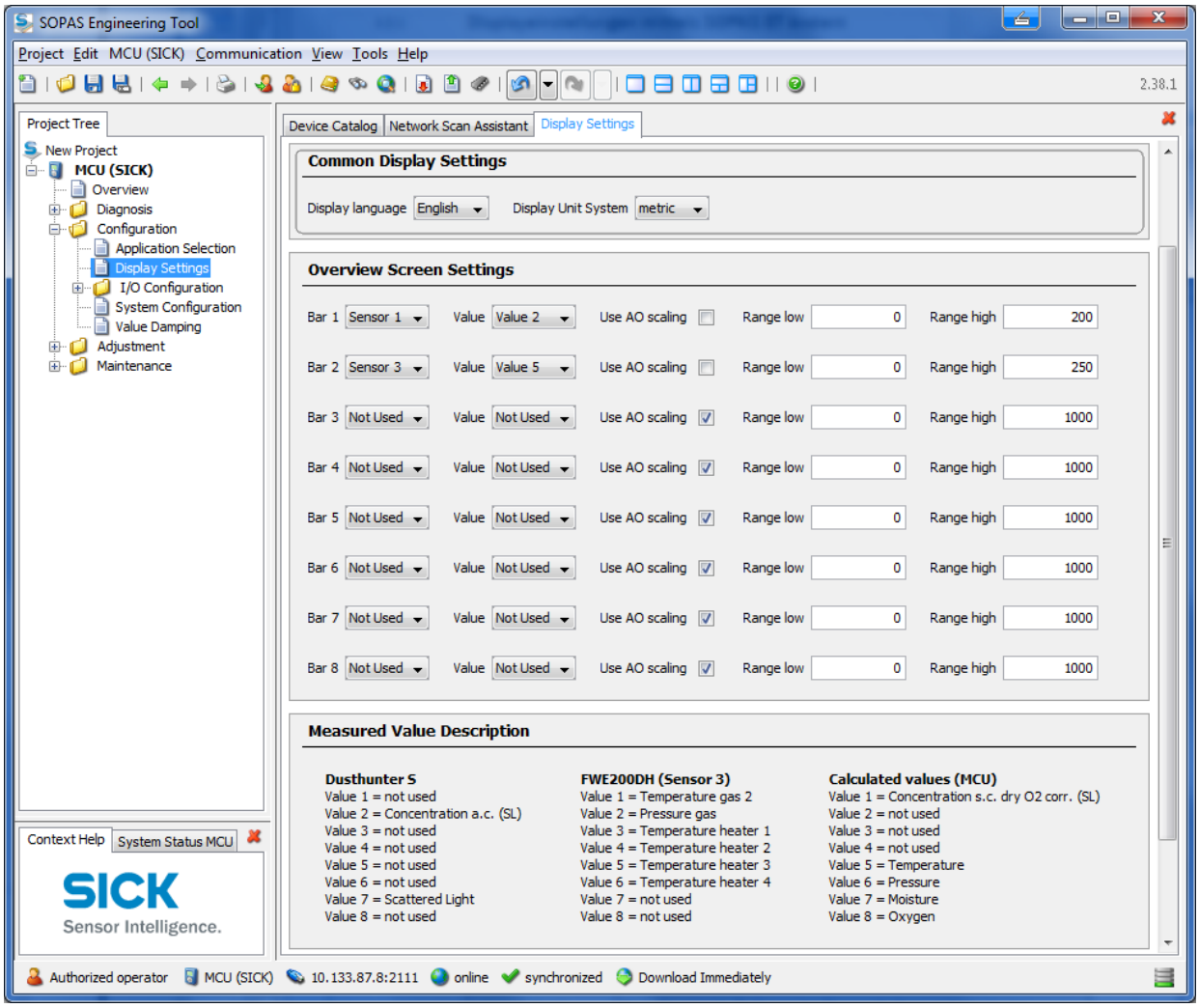
*: Not usable for FWE200DH (must be set to “unlimited”)

Subject to change without notice

4.6.4 Using SOPAS ET to modify display settings

To modify factory settings, select device file “MCU” in the “Project Tree” window, enter the level 1 password and select the “Configuration / Display Settings” directory.

Fig 87 Directory “Configuration / Display Settings” (example)



Window	Entry field	Description
Common Display Settings	Display language	Language version shown on the LC-Display
	Display Unit System	Unit of measurement system used in displays
Overview Screen Settings	Bars 1 to 8	Sensor address for the first measured value bar in the graphic display
	Value	Measured value index for the respective measured value bar
	Use AO scaling	When activated, the measured value bar is scaled to the associated analog output. If not activated, define the limit values separately
	Range low	Values for separate scaling of the measured value bar independent of the analog output
	Range high	

The measured value assignment is listed in the bottom field.

Subject to change without notice

Subject to change without notice

FWE200DH

5 Maintenance

General information
Maintenance work
Putting the measuring system out of operation

Subject to change without notice

5.1 General information

5.1.1 Maintenance intervals

The equipment operator must specify the maintenance intervals. The period depends on existing operating parameters such as gas temperature and wetness, dust content and state, how the equipment is run and ambient conditions. Therefore only general recommendations can be made here.

Plan short intervals after measuring system startup that can then be adapted step by step to meet the respective requirements.

The activities required and their completion must be documented by the operator in a Maintenance Manual.

Recommendation

Interval	Work to be performed
1 week	Visual inspection
1 month	Check/clean jets in inlet nozzles of the thermo cyclone
	Check/clean the ejector
	Check/clean the suction nozzle
	Check/clean the intermediate nozzle
3 months	Check/clean the sample gas probe
	Check /clean the extraction and return hoses
	Check/clean the swirl chamber (in the thermo cyclone)
6 months	Check/clean the optical surface in the measuring sensor
	Check/clean the blower unit filter element

5.1.2 Maintenance contract

Scheduled maintenance work can be carried out by the equipment operator. Only qualified personnel according to Section 1 should be allowed to do the work. If requested, all maintenance activities can also be performed by SICK Service or an authorized Service partner. SICK offers cost-effective maintenance and repair contracts. SICK carries out all maintenance and repair work within the framework of these agreements. Any repairs will be made by specialists onsite whenever possible.

5.1.3 Auxiliary means required

- Water
- Cleaning cloths (lint-free)
- Optics cloth, cotton swabs
- Jaw wrench, SW 7, 8, 13 and 19
- Allen key, SW 7
- Screwdriver with crosshead (middle size) and slot screwdriver (small).

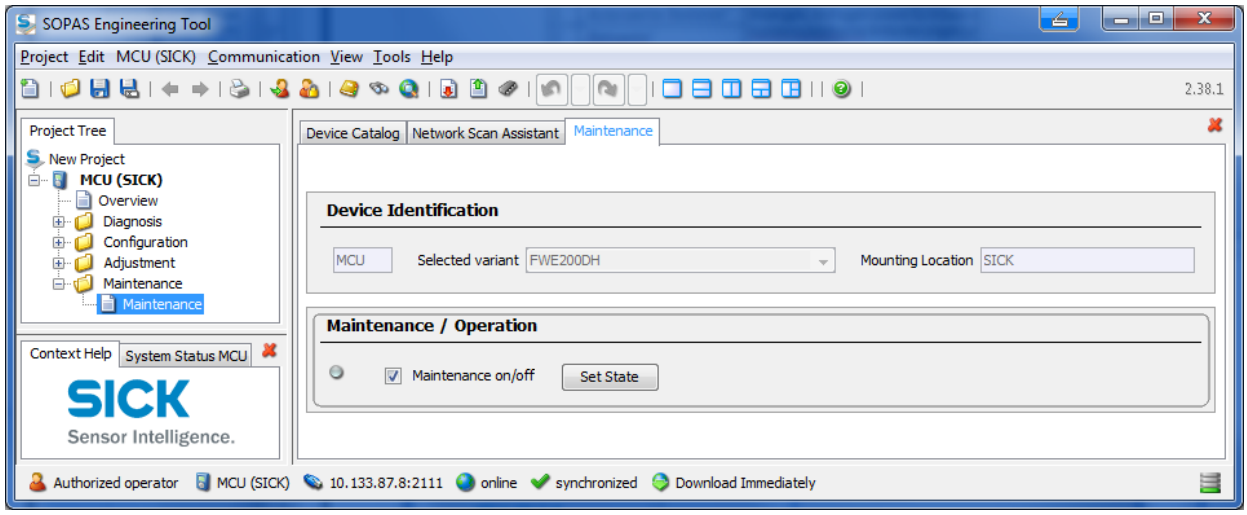
Subject to change without notice

5.1.4 Setting “Maintenance” mode

Take the following steps to set the measuring system to “Maintenance” mode before starting maintenance work.

- ► Connect the measuring system to the laptop/PC using the USB cable and start SOPAS ET.
- ► Click “Network Scan” in tab “Network Scan Assistant”, select device file “MCU” and move it to window “Project Tree” (→ p. 66, §4.2.3.5).
- ► Switch to directory “Maintenance / Maintenance”, activate the “Maintenance on/off” checkbox in the “Maintenance / Operation” group and click “Set State” (see → Fig. 88).

Fig 88 Setting “Maintenance” mode



- “Maintenance” mode can also be set using the buttons on the LC-Display of the control unit (→ p. 104, §4.6.2) or by connecting an external maintenance switch to the terminals for Dig In2 (17, 18) in the control unit → p. 41, §3.3.2).
- An automatic function check is not carried out during “Maintenance”.
- The value set for “Maintenance” is output on the analog output (→ p. 74, §4.3.5). This also applies when a malfunction exists (signalized on the relay output).
- When “Maintenance” mode is only set using SOPAS ET, this state is reset after a voltage failure. The measuring system switches automatically to “Measurement” after the operating voltage is switched on again.

Resume measuring operation after completing the work (deactivate the “Maintenance on/off” checkbox in the “Maintenance / Operation” window and click “Set State”).

Subject to change without notice

5.2 Maintenance work

NOTICE:

- During maintenance work, it must be possible to switch the power supply of the FWE200DH off using a power isolating switch/circuit breaker in accordance with EN61010-1.
- After completion of the work or for test purposes, the power supply may only be activated again by the personnel who carried out the work and complying with the valid safety regulations.

WARNING: Hazard through chemical compounds

Acids or bases can be created when deposits are dissolved when cleaning gas-carrying parts (hoses, nozzles etc.) with water.

- ► Take suitable protective measures and use suitable protection devices.
- ► Observe the relevant safety regulations as well as the safety notices (→ p. 12, §1.3) during all work.

5.2.1 Preparatory work

► Remove the sample gas probe and close off the assembly opening with a blind flange.

WARNING: Hazard through gas and hot parts

Hot and/or aggressive gases can escape when removing and fitting the sample gas probe as well as gas-carrying parts.

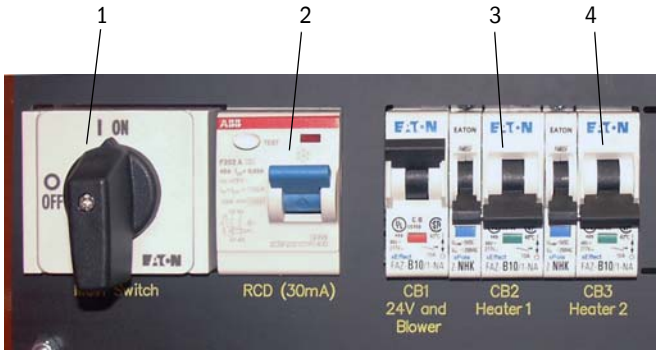
- ► Take suitable protective measures and use suitable protection devices.
- ► Observe the relevant safety regulations as well as the safety notices (→ p. 12, §1.3) during all work.
- ► Only remove or fit the sample gas probe on equipment with hazard potential (higher internal duct pressure, hot or aggressive gases) when the equipment is at a standstill.

► Switch off the fuses for heating bands 1 and 2 in the control unit.

The blower unit switches off when the average value of both heater temperatures is below the warning threshold of the nominal temperature (default: 160 °C - 10K = 150 °C), at the latest at temperatures < 80 °C.

► Switch the main switch in the control unit off and wait until hot parts have cooled down sufficiently.

Fig 89 Main switch and fuses in the control unit



1 Main switch
2 FI circuit breaker
3 Fuse for heating band 1
4 Fuse for heating band 2

Subject to change without notice

5.2.2 Visual inspection

- ► Check all hose connections for firm seat and leak tightness.
- ► Check the flow using the differential pressure (must be selected as measured value for display on the LC-Display → p. 107, Fig. 87).

  The value must be in the range 1 to 4 mbar when the blower is running.

  If this is not the case:

  - ► Check all gas-carrying parts for deposits and clean when necessary (see following Section).
- ► Check running noise of the blower (must be within the normal frequency range); loud noise signals a possible device failure.

  - ► Put the measuring system out of operation (→ p. 121, §5.3) and then check the blower unit.

Subject to change without notice

5.2.3

Cleaning the inlet nozzles on the thermo cyclone

- ► Loosen hose clip (1) and pull extraction hose (2) off the connection of adapter (3).
- ► Carefully loosen quick-release clamps (4) of the adapter and take the adapter off.
- ► Pull jet (5) out of the adapter and remove O-ring (6)
- ► Pull inlet nozzle (8) out of the thermo cyclone and remove O-rings (7).

> The inlet nozzle may sit very tight.

- ► Clean the nozzles and O-rings with water.

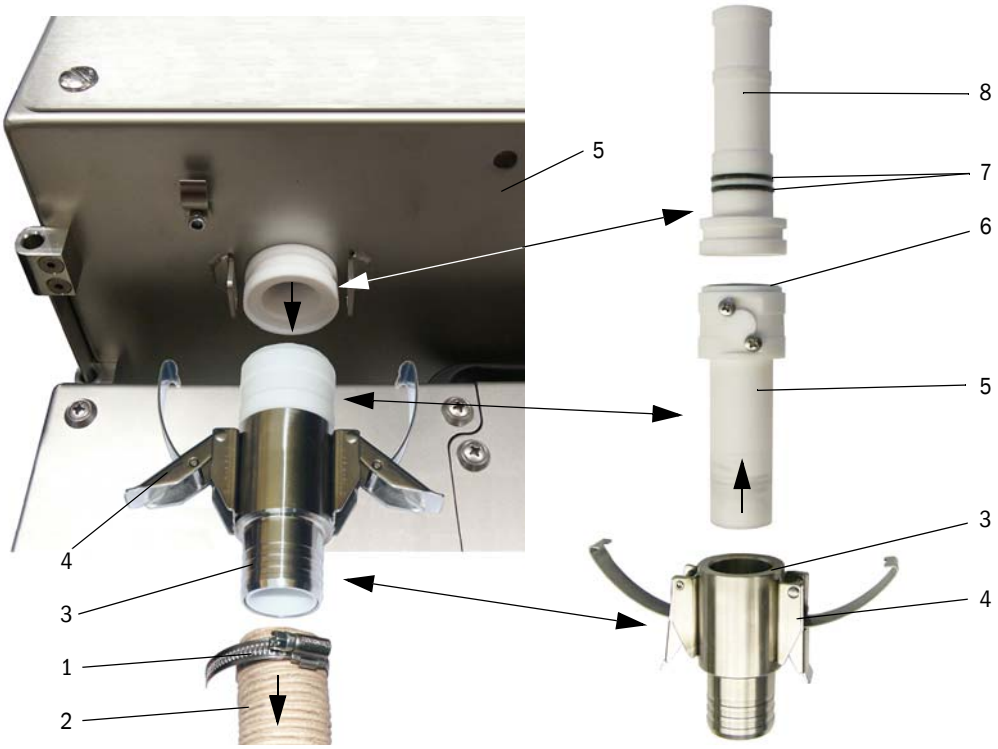
  Carefully remove solid deposits (when present) with suitable tools without damaging the nozzles.

  Fit new nozzles and/or O-rings when these are worn or damaged.
- ► Refit the O-rings and grease the two on the inlet nozzle with high-vacuum grease, insert the nozzles, fit and fasten the adapter.

> Position the adapter centered on the inlet nozzle and tighten both quick-release clamps at the same time.

- ► Push the extraction hose onto the adapter connection and fasten with a hose clip.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig 90 Inlet nozzlen



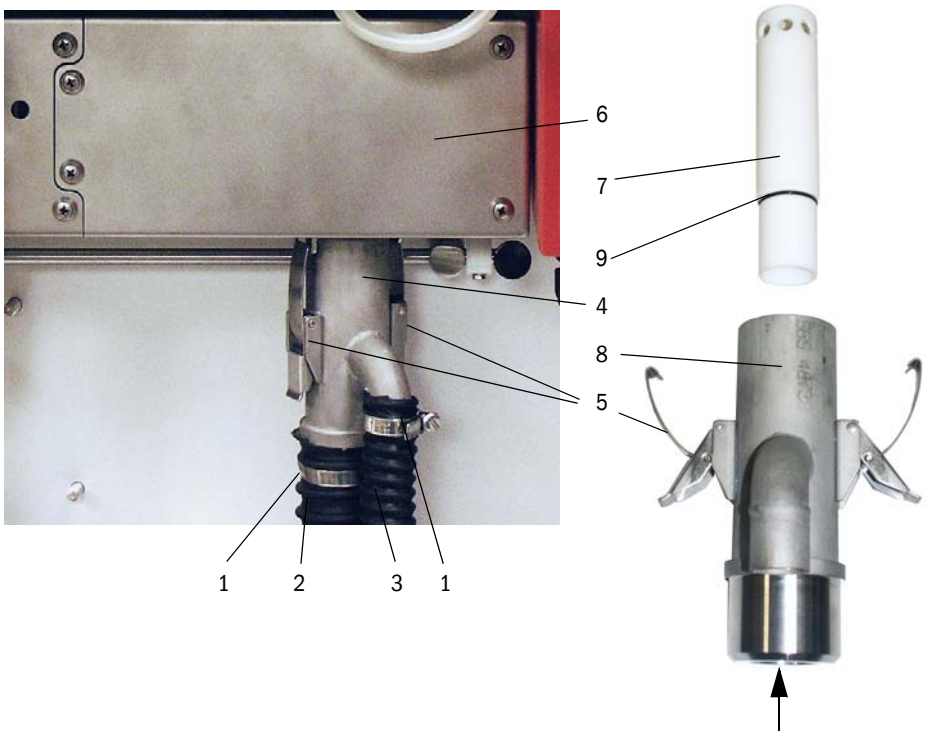
Subject to change without notice

5.2.4

Cleaning the ejector

- Loosen hose clips (1) of return hose (2) and the hose to blower unit (3) on ejector (4) and take the hoses off.
- Loosen quick-release clamps (5) on measuring cell (6) and take the ejector off.
- Press mixing tube (7) out of ejector housing (8).
- Clean the mixing tube, O-ring (9) and ejector housing with water.
  Check parts for wear or damage and replace with new parts when necessary.
- Reassemble the ejector in reverse sequence and fit on the measuring cell.
- Connect the hoses and secure with hose clips.
- Fit the sample gas probe.
- If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig 91 Ejector

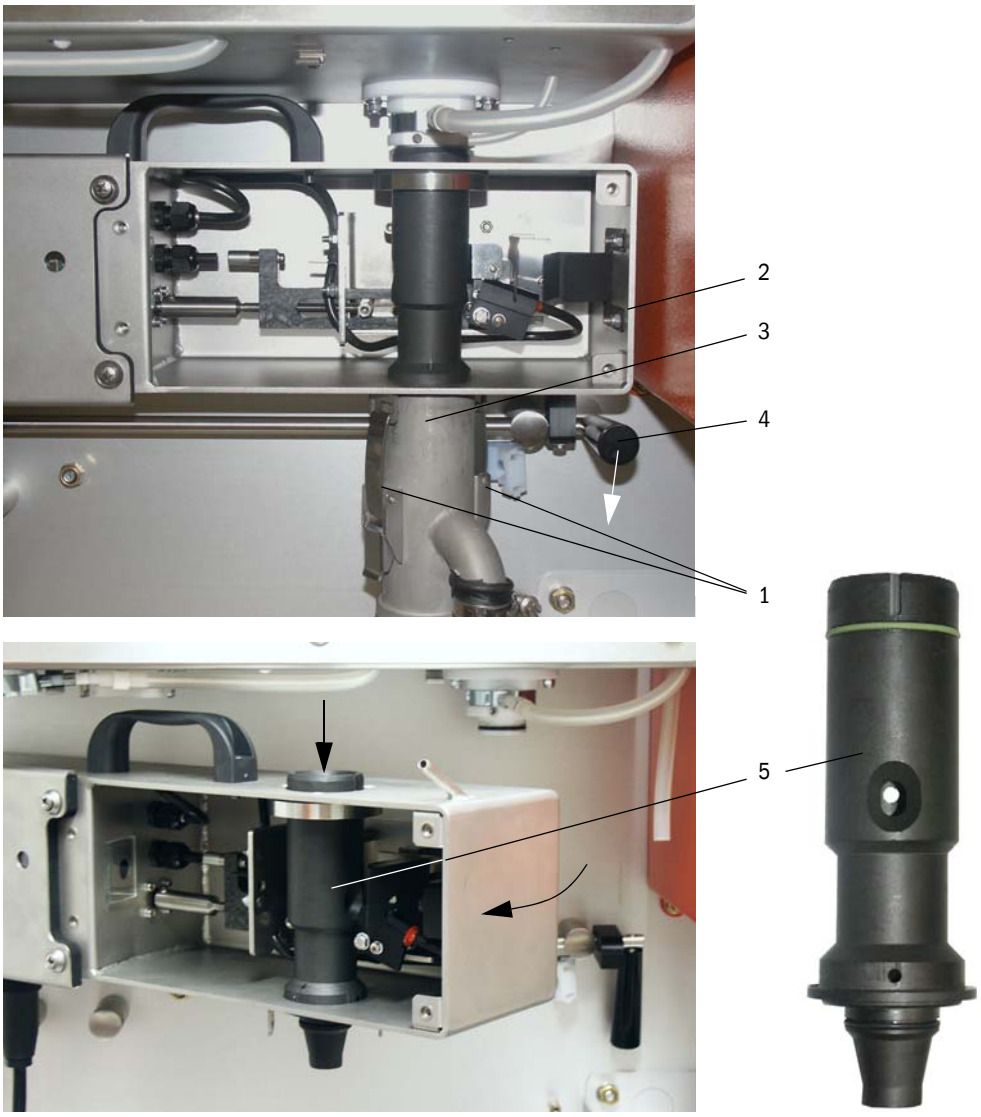


Subject to change without notice

5.2.5 **Cleaning the suction nozzle**

- ► Loosen quick-release clamps (1) on measuring cell (2) and take ejector (3) off.
- ► Push lever (4) that locks the measuring sensor down and swivel the measuring sensor out to the left.
- ► Press suction nozzle (5) downwards (e.g., with a light tap with the ball of the hand), remove and clean it with water.
- ► Fit and fasten the ejector.
- ► Reassemble and lock the measuring sensor.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig 92 Cleaning the suction nozzle

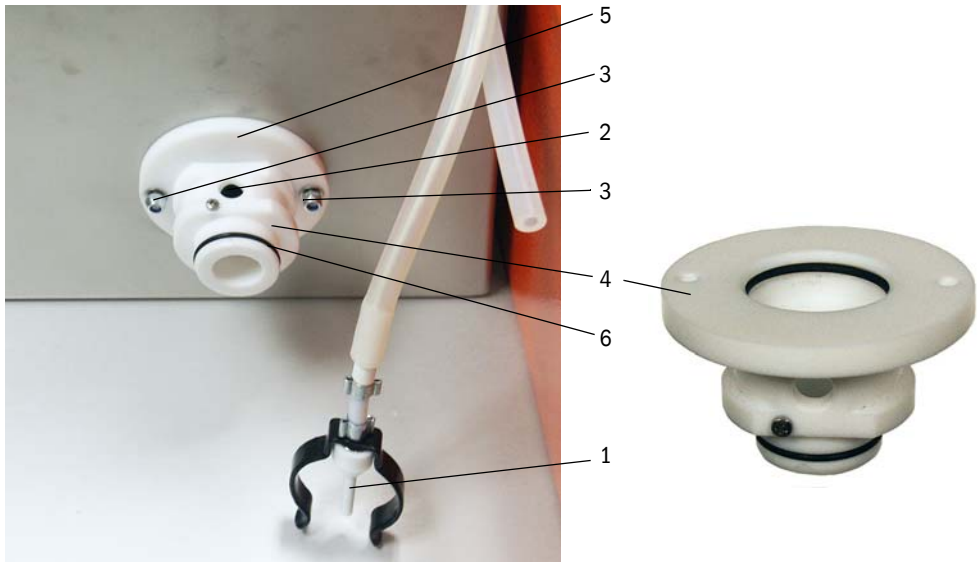


Subject to change without notice

5.2.6 Cleaning the intermediate nozzle

- ► Pull the hose for differential pressure measurement of the connection (→ p. 116, Fig. 92).
- ► Push the lever that locks the measuring sensor down and swivel the measuring sensor out to the left.
- ► Pull sample gas sensor (1) out of opening (2)
- ► Loosen fastening nut (3), turn intermediate nozzle (4), take it out of holder (5) and clean with water.
- ► Check O-ring (6) and replace when necessary.
- ► Refit the intermediate nozzle, swivel the measuring sensor back in and lock.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig 93 Cleaning the intermediate nozzle



5.2.7 Cleaning the sample gas probe and extraction and return hoses

- ► Loosen the hose clips on both ends of the extraction and return hoses and pull the hoses off.
- ► Clean the hoses and sample gas probe with water.
  Replace worn or defective hoses with new ones (extraction hose Part No. 5313673, return hose Part No. 5328761).
- ► Connect the hoses and secure with hose clips.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

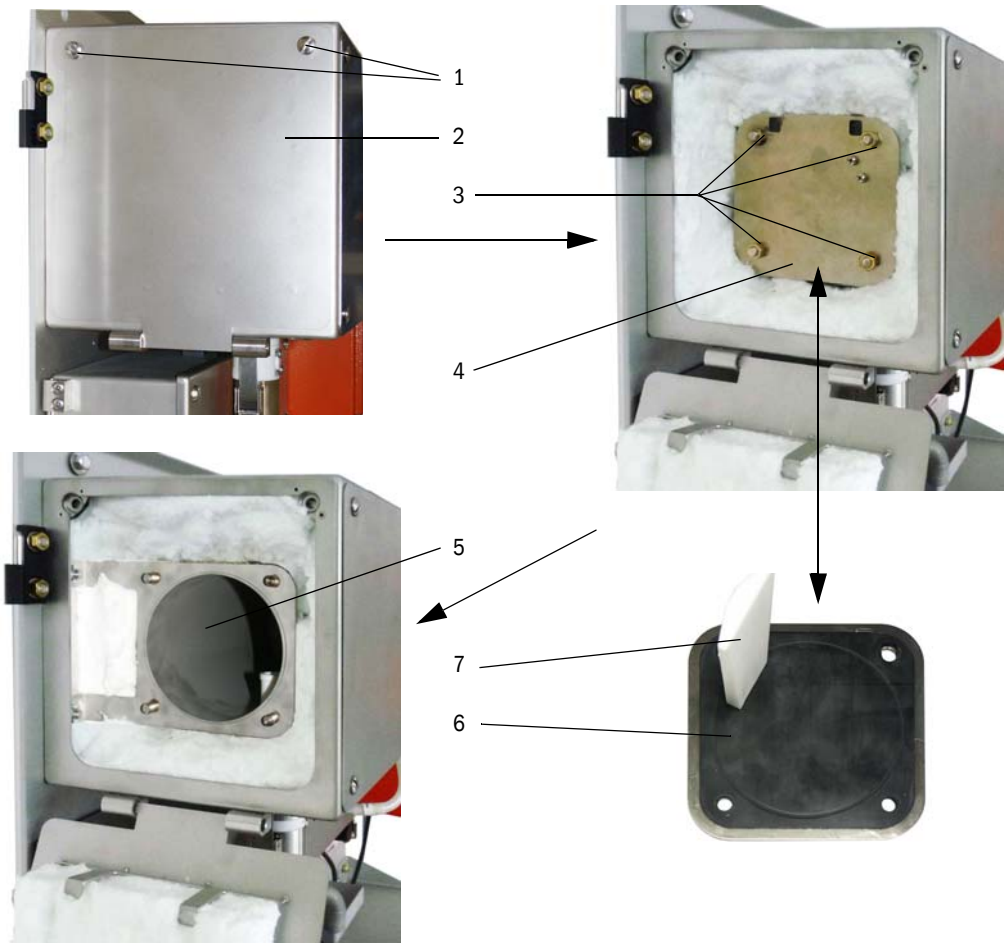
Subject to change without notice

5.2.8 **Cleaning the swirl chamber**

- ► Loosen fastening screws (1) of cover (2) and fold the cover down.
- ► Loosen fastening nuts (3) of cover (4) of swirl chamber (5) and take the cover with seal (6) off.
- ► Clean the swirl chamber inside with water.

  Carefully remove any deposits with suitable tools. Replace the swirl chamber with heavy wear or damage with a new one (see Service Manual).
- ► Check the seal and baffle plate (7) and replace when necessary.
- ► Reassemble the thermo cyclone.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Fig 94 Cleaning the swirl chamber



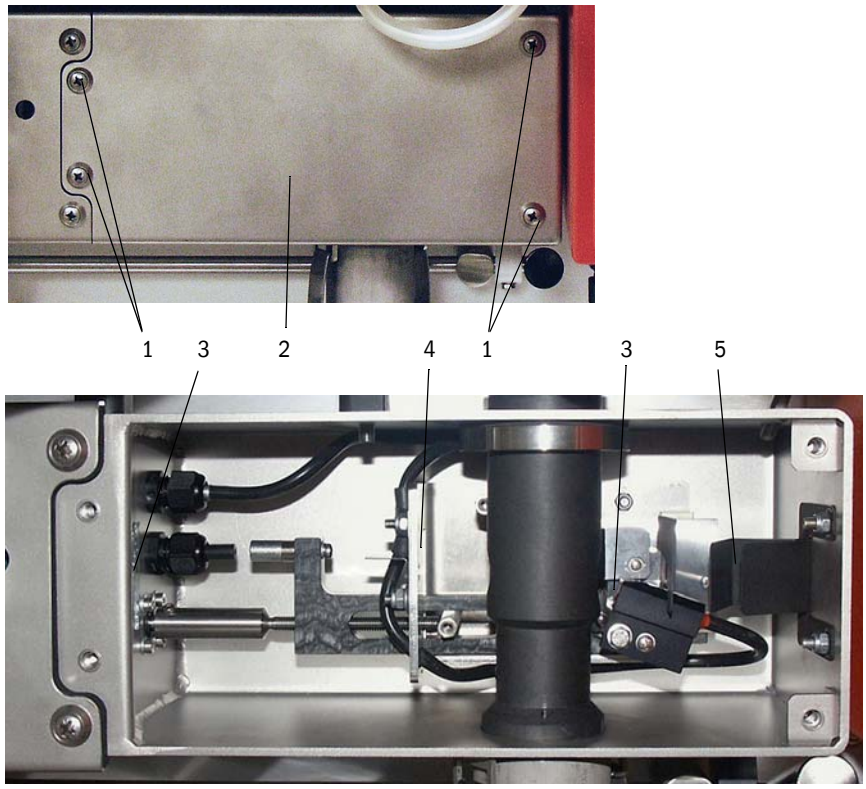
Subject to change without notice

5.2.9 Cleaning the optical surfaces

Clean the optical surfaces when deposits can be seen or before contamination reaches the maximum allowable contamination (limit value 30% for warning, 40% for malfunction). The current contamination value can be read out on the LC-Display or in SOPAS ET.

- ► Loosen fastening screws (1) for cover (2) of the measuring cell and take the cover off.
- ► Carefully clean glass surfaces (3) and apertures (4) with cotton swabs, and also clean light trap (5) when necessary.

Fig 95 Cleaning optical surfaces



Higher contamination values (above approx. 10%) which cannot be reduced even by cleaning several times indicate wear of the optical surfaces. Values up to approx. 10% do not however have any influence on measuring behavior and precision.

- ► Check the seal for the cover and replace when necessary.
- ► Fit the sample gas probe.
- ► If switched off, switch the fuses for the heating bands on and start the FWE200DH.

Subject to change without notice

5.2.10

Checking / replacing the filter element of the blower unit

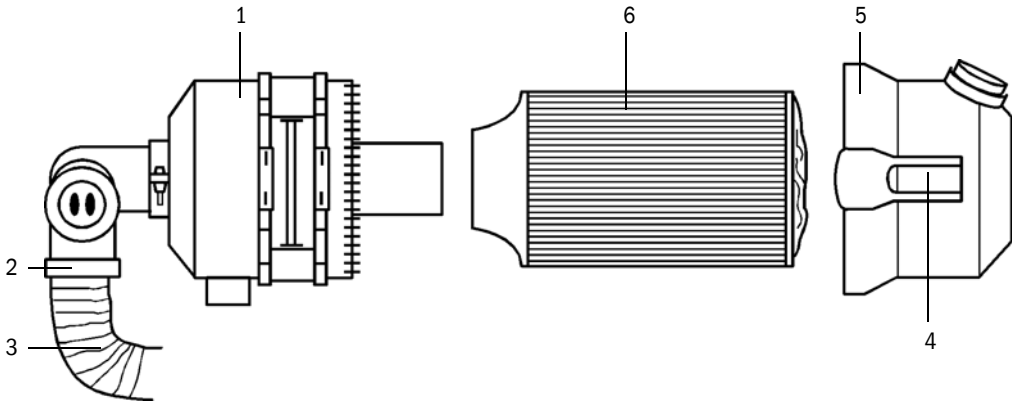
Depending on the degree of contamination of the ambient air suctioned in, the operator must check the filter element for contamination in intervals to be defined. Replace the filter element when:

- Severe contamination (deposits on the filter surface) is visible.
- The purge air volume is reduced considerably as compared to operation with a new filter.

The FWE200DH can continue running when cleaning the filter housing and replacing the filter element

Work to be performed

Fig 96 Replacing the filter element



- ► Clean outside of filter housing (1).
- ► Loosen hose clip (2) and clamp hose (3) to a clean location.

> ***NOTICE:***
> ► Place the end of the hose in a safe place so that foreign objects cannot be sucked in (this will cause irreparable damage to the blower), but do not close the end of the hose! Unfiltered purge air penetrates the ejector during this time.

- ► Press snap locks (4) together and take off filter housing cover (5).
- ► Remove filter element (6) with twisting-pulling movements.
- ► Clean the inside of the filter housing and the filter housing cover with a cloth and brush.

> ***NOTICE:***
> ► For wet cleaning, use only a water-soaked cloth and then dry the parts well.

- ► Check the filter element and replace when necessary.
- ► *Spare part*: Filter element Micro-Top element C11 100, Part No. 5306091
- ► Insert the filter element with twisting-pressing movements.
  Position the filter housing cover, ensuring that it is aligned correctly with the housing, and snap the quick-releases into place.
- ► Connect the hose onto the filter outlet again and fasten with hose clip.

Subject to change without notice

5.3 Putting the measuring system out of operation

The FWE200DH should remain in operation during short equipment standstills. For longer standstills (as from approx. 1 week), we recommend putting the FWE200DH out of operation.

NOTICE:
Put the FWE200DH out of operation immediately should the blower unit fail.

WARNING: Hazard through gas and hot parts

- ► Observe the relevant safety regulations as well as the safety notices in Section 1 during all disassembly work.
- ► Take suitable protection measures against possible local hazards or hazards arising from the equipment.
- ► Secure switches that should not be switched on again for safety reasons with signs and safeguards to prevent unintentional switching.

Work to be performed

► Take the sample gas probe out of the gas duct.

WARNING: Hazard through gas and hot parts

- ► Only remove the sample gas probe on equipment with hazard potential (hot or aggressive gases, higher internal duct pressure) when the equipment is at a standstill.

► Close off the assembly opening with a blind flange.

► Loosen the hose connections on the sample gas probe.

► Switch the main switch off.

► After all hot parts have cooled down, remove the measuring and control unit and blower unit, and store all components in a clean, dry location.

► Use suitable auxiliary means to protect the plug-in connectors against dirt and moisture.

Subject to change without notice

Subject to change without notice

FWE200DH

6 Troubleshooting and Error Handling

General information

Warning and error messages in SOPAS ET

Subject to change without notice

6.1 General information

Warning messages are output when internal limits for individual device functions/ components are reached or exceeded which can then lead to erroneous measured values or an imminent failure of the measuring system.

Warning messages do not imply a malfunction of the measuring system. The current measured value continues to be output on the analog output.

See the Service Manual for a detailed description of messages and options for clearance.

6.1.1 Display of warning and malfunction messages

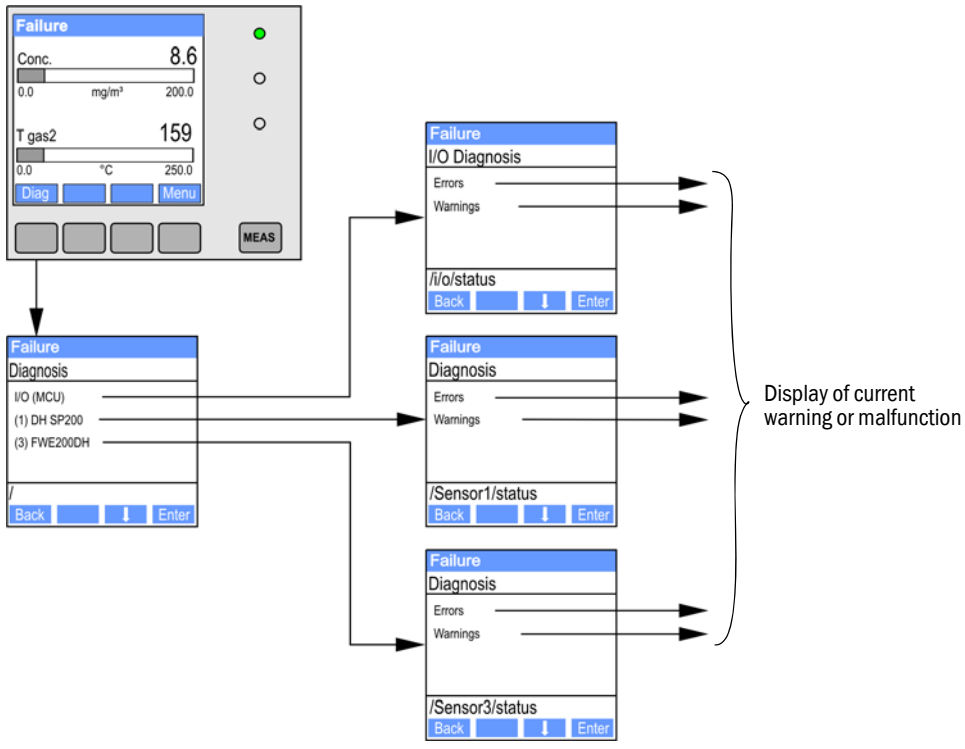
Warnings or device malfunctions are signaled by:

- Status relays (→ p. 42, §3.3.2.1).
- LC-Display of the measuring and control unit

  “Maintenance request” or “Malfunction” displayed in the status line (→ p. 103, §4.6.1). In addition, the respective LED goes on (“MAINTENANCE REQUEST” for warnings, “FAILURE” for errors).

  After pressing “Diag”, possible causes are shown as short information in the menu “Diagnosis” after selecting the device (“DH SP200”, “FWE200DH”, “MCU”).

Fig 97 Display on the LC-Display



- In SOPAS ET

  “Diagnosis / Error messages/warnings” provides detailed information on the current device state.

Subject to change without notice

6.1.2 Malfunctions

Symptom	Possible cause	Action
No display on the LCD	• Main switch and/or fuses switched off • Main supply voltage missing • Defective fuse • Cable to LC-Display not connected or damaged • Defective subassemblies	► Check voltage supply. ► Check connection cable. ► Exchange fuse. ► Contact SICK Service.
Analog output on Live Zero	• Device set to “Maintenance” mode • Device has function fault(s)	► Check device status. ► Measuring range selected too large. ► Contact SICK Service.

Subject to change without notice

6.2 Warning and error messages in SOPAS ET

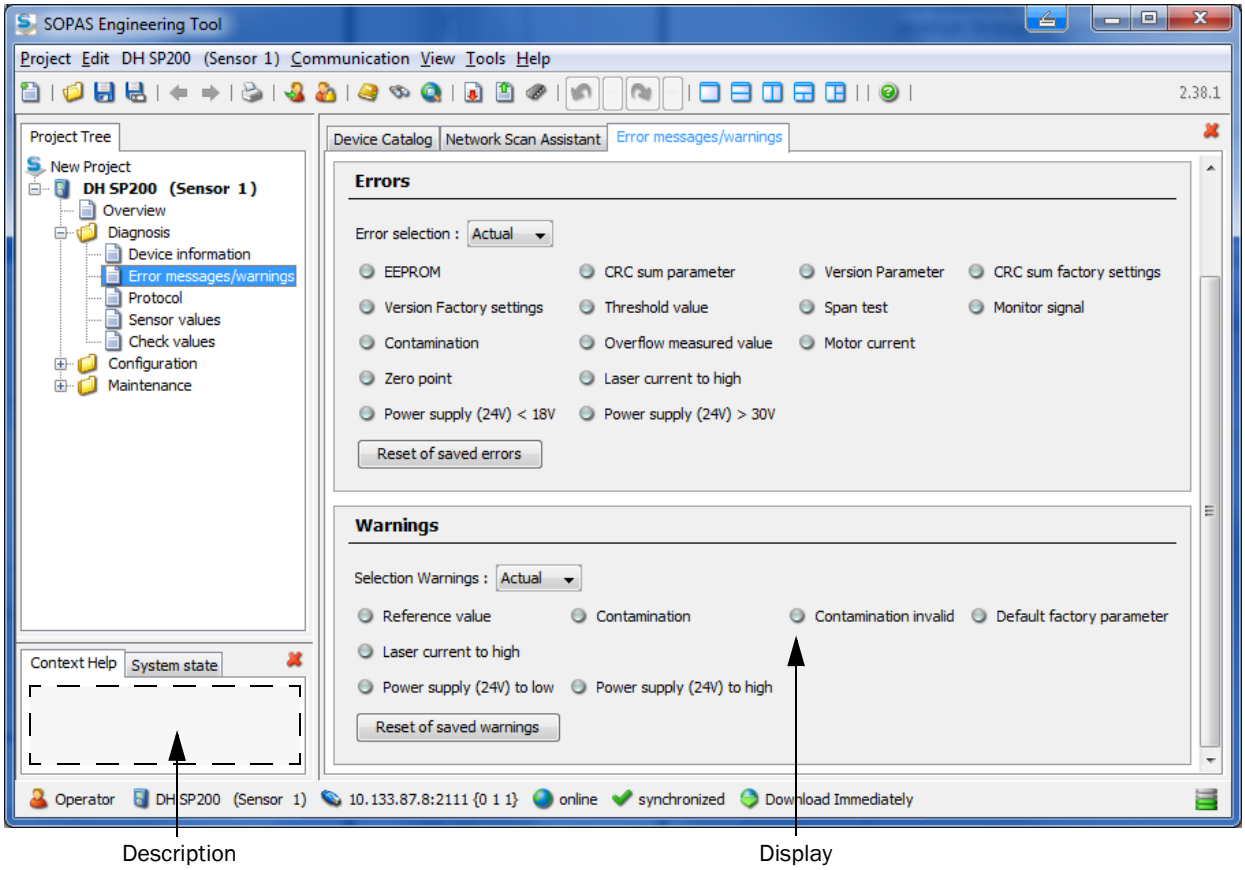
To display, connect the measuring system to SOPAS ET and start the device file “DH SP200”, “FWE200DH” or “MCU” (→ p. 66, §4.2.3.5).

Move the mouse to the respective message to display more details on the significance of individual messages in a separate window. Click on the display to view a short description of possible causes and clearance for certain messages as “Context help”.

Select “Actual” or “Saved” in the “Error selection” or “Warnings selection” window to view current or previous warning and malfunction messages recorded in error memory.

6.2.1 Measuring sensor

Fig 98 “Diagnosis / Error messages/Warnings” directory



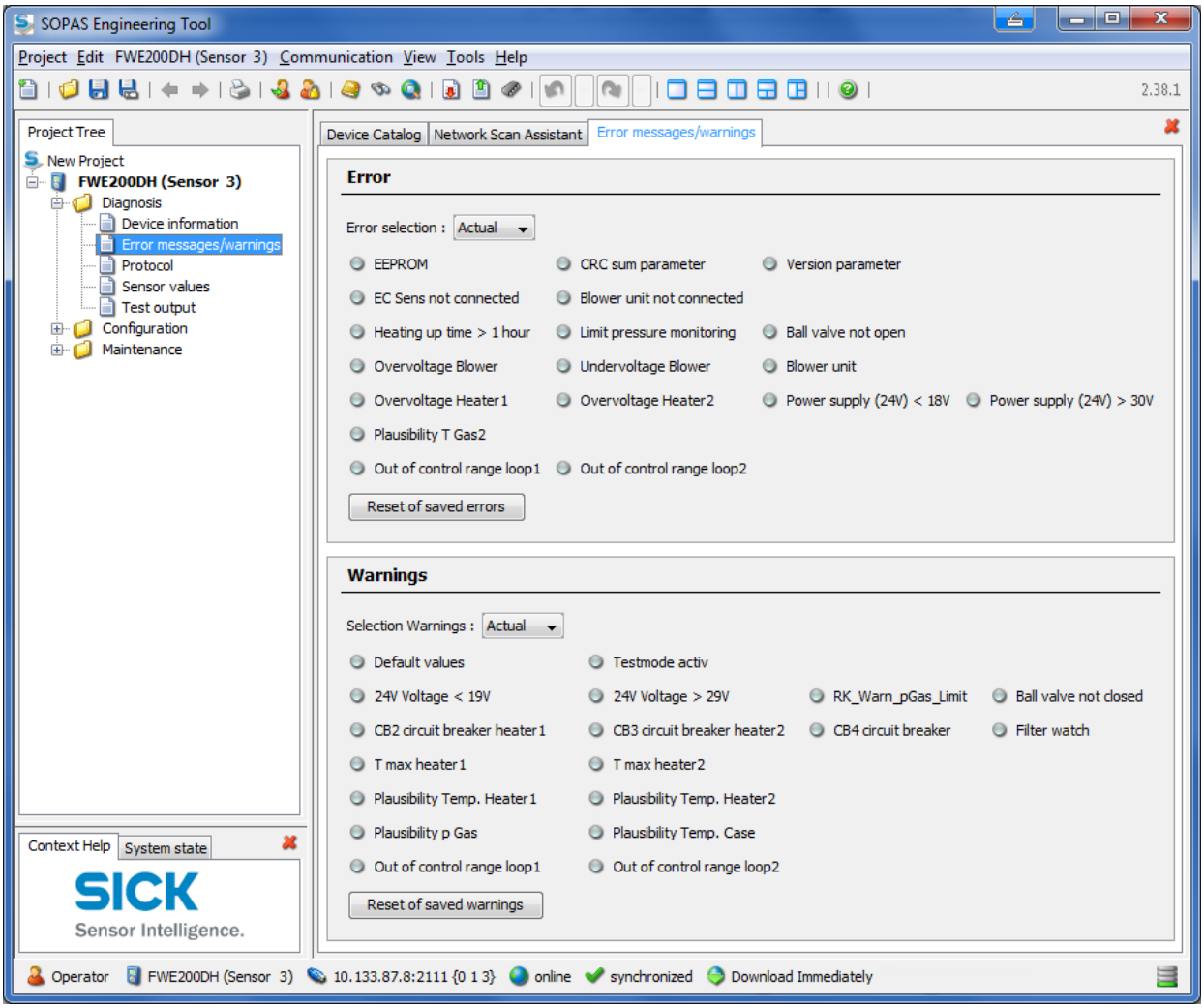
Malfunctions listed below can probably be cleared onsite.

Message	Description	Possible cause	Action
Contamination	Received light intensity is lower than the allowed limit (→ p. 132, §7.1)	• Deposits on the optical surfaces • Unclean purge air	▶ Clean optical surfaces (→ p. 119, §5.2.9). ▶ Check purge air filter (→ p. 120, §5.2.10) ▶ Contact SICK Service.
Span test	Deviation from setpoint value > ±2%.	Sudden changes in measuring conditions during determination of control values	▶ Repeat the function check. ▶ Contact SICK Service.

Subject to change without notice

6.2.2 Measuring system

Fig 99 “Diagnosis / Error messages/Warnings” directory



Malfunctions listed below can probably be cleared onsite.

Warning messages

Message	Description/possible cause	Action
Default value set	Measuring system set to delivery parameters	▶ Configure the measuring system in accordance with requirements
Test operation activated	Automatic heating control and blower unit control deactivated	▶ Set the system to Measuring mode
CB2 fuse, heater 1 CB3 fuse, heater 2	Limit value exceeded	▶ Clean gas paths (→ p. 112, §5.2). ▶ Check/correct configuration (→ p. 71, §4.3.3.2). ▶ Contact SICK Service.

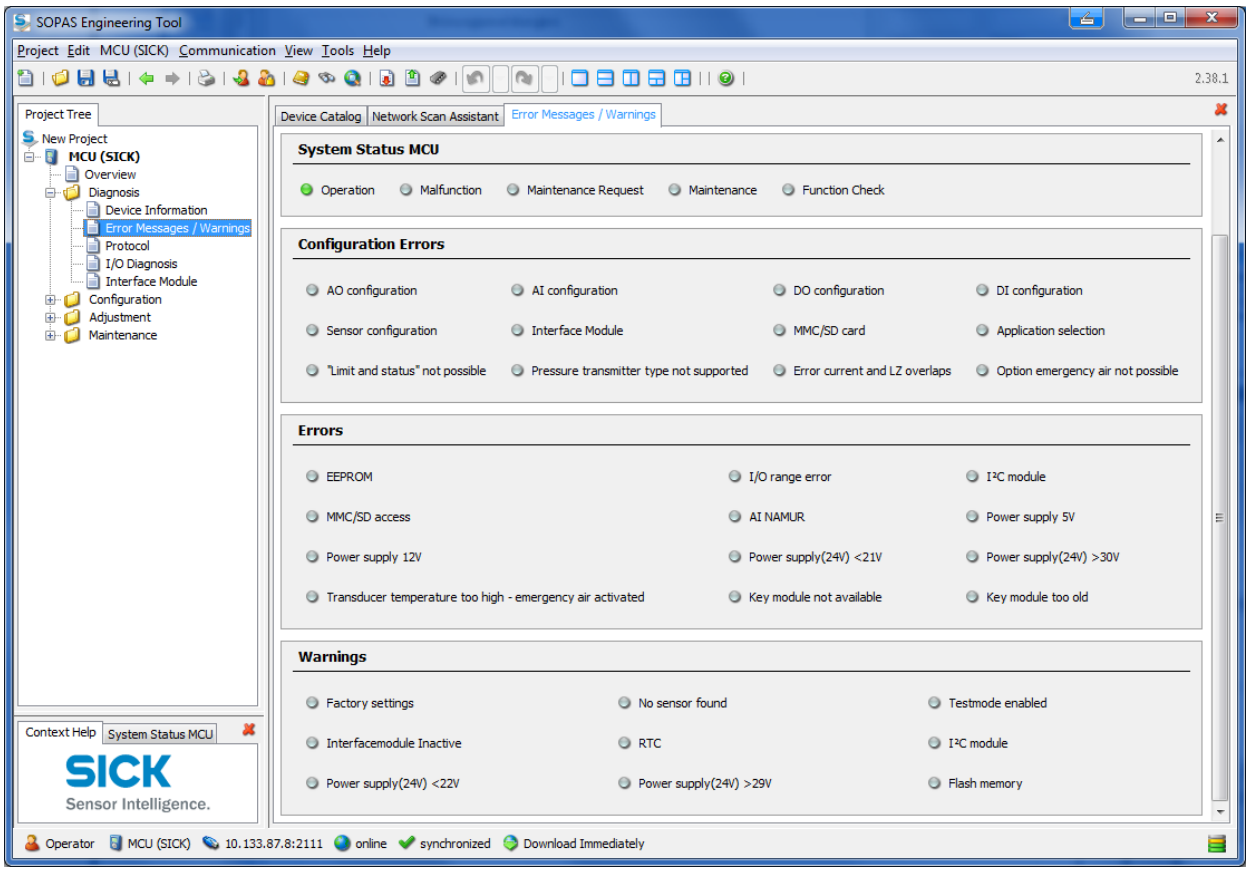
Subject to change without notice

Malfunction messages

Message	Description/possible cause	Action
Blower unit not connected	Blower unit not connected or not connected correctly (→ p. 45, §3.3.2.2).	▶ Check and correct connection ▶ Contact SICK Service.
Limit value pressure monitoring	Limit value underflown.	▶ Clean gas paths (→ p. 112, §5.2). ▶ Check/correct configuration (→ p. 71, §4.3.3.2). ▶ Contact SICK Service.

6.2.3 Control unit

Fig 100 “Diagnosis / Error messages/Warnings” directory



Malfunctions listed below can probably be cleared onsite.

Subject to change without notice

Warning messages

Message	Description	Possible cause	Action
No sensor found	Measuring sensor and/or system control not recognized	• Communication problems on RS485 line • Supply voltage problems	▶ Check system settings. ▶ Check connection cable. ▶ Check voltage supply. ▶ Contact SICK Service.
Testmode enabled	MCU in “Test” mode.		▶ Deactivate “System Test” mode (“Maintenance” directory)
Interface module inactive	Interface module not configured		▶ Configure the interface module (→ p. 98, §4.4.2.2).

Malfunction messages

Message	Description		Action
I/O range exceeded/ underflown	Analog output/input current exceeded/underflown	• Measured value above set range • Configuration error • Load does not match specification	▶ Check input/output range values with multimeter. ▶ Contact SICK Service.

Configuration error

Message	Description	Possible cause	Action
AO configuration	Number of available and configured analog outputs not identical.	• AO not configured • Connection error • Module failure	▶ Check configuration (→ p. 74, §4.3.5). ▶ Contact SICK Service.
AI configuration	Number of available and configured analog inputs not identical.	• AI not configured • Connection error • Module failure	▶ Check configuration (→ p. 77, §4.3.6). ▶ Contact SICK Service.
DO configuration	Not relevant for FWE200DH		
DI configuration			
Sensor configuration	Number of available sensors does not match the number of sensors connected.	• Sensor failure • Communication problems on RS485 line	▶ Check measuring sensor/system control. ▶ Check connection cable. ▶ Contact SICK Service.
Interface Module	No communication via Interface module	• Module not configured • Connection error • Module failure	▶ Check configuration (→ p. 98, §4.4.2.2). ▶ Contact SICK Service.

Subject to change without notice

Subject to change without notice

FWE200DH

7 Specifications

Technical Data
Dimensions, Part Nos.
Options
Consumable parts for 2-years operation

Subject to change without notice

7.1 Technical Data

Measuring Parameters	
Measured variable	Scattered light intensity Dust concentration output in mg/m³ after gravimetric comparison measurement
Measuring range (freely adjustable)	Smallest range: 0 ... 5 mg/m³ Largest range: 200 mg/m³ higher on request, in-between freely configurable
Measuring precision	±2% of upper measuring range value
Reaction time	0.1 ... 600 s; freely selectable
Application Data	
Gas temperature	Max. 120 °C for PVDF probes Max. 220 °C for Hastelloy probes (higher on request)
Internal duct pressure	± 20 hPa
Gas wetness	Max. 10 g water per m³ (weight share 1%) as fluid share without water vapor (higher on request)
Gas velocity	7 to 30 m/s
Ambient temperature	-20 ... +50°C Housing necessary for other temperature limits -20 ... +45°C Intake temperature for purge air
Function Check	
Automatic self-test	Linearity, drift, aging, contamination Contamination limit value: From 30% warning: From 40% malfunction
Manual linearity check	Using a reference filter (test equipment for linearity test)
Displays	
LC-Display on control cabinet	Displays measured values and system states
Output Signals	
Analog outputs	3 outputs 0/2/4 ... 22 mA, max. load 750 Ω; electrically isolated
Relay outputs	5 potential-free outputs (changeover contacts) for status signals; load 48 V, 1 A
Input Signals	
Analog inputs	6 inputs 0...20 mA (standard; without electric isolation); precision ± 0.1 mA
Digital inputs	8 inputs for connecting potential-free contacts (→ p. 42, §3.3.2.1)
Communication Interfaces	
USB 1.1	For measured value inquiries and software updates per PC/laptop using the operating program
RS485	For connecting the remote unit option
Interface module	For communication with higher-level control systems, Modbus TCP as standard Alternately Profibus DP, Ethernet
Power Supply	
Voltage supply	115 / 230 V AC, 50 / 60Hz
Power consumption	Max. 1.7 kW (standard version without extraction hose option)
Dimensions (W x H x D), Weight	
Measuring and control unit	Approx. 820 x 730 x 300 mm; approx. 65 kg
Sample gas probe	Length 730 mm (NL 600 mm); 1330 mm (NL 1200 mm); max. 15 kg
Blower unit	550 mm x 550 mm x 258 mm; with weatherproof cover 605 mm x 550 mm x 350 mm; approx. 16 kg
Miscellaneous	
Protection class	IP 54 (electronic housing IP 65)
Laser	Laser class 1 in operating state, laser class 2 in open state; Capacity < 1 mW; wavelength between 640 nm and 660 nm
Blower feed amount	Approx. 30 ... 40 m³/h

Subject to change without notice

Compliances

The technical version of this device complies with the following EU directives and EN standards:

- EU Directive: LVD (Low Voltage Directive)
- EU Directive: EMC (Electromagnetic Compatibility)

Applied EN standards:

- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement technology, control technology and laboratory use - EMC requirements
- EN 14181, Emissions from stationary sources - Quality assurance for AMS
- EN 15267-3: Certification of automated measuring systems - Part 3

Measuring system FWE200DH meets the requirement for EMC regarding emission and immunity for industrial environments.

Electrical protection

- Insulation: Protection class 1 in accordance with EN 61010-1.
- Contamination: The device operates safely in an environment up to degree of contamination 2 according to EN 61010-1 (usual, not conductive contamination and temporary conductivity by occasional moisture condensation).
- Electrical energy: The wiring system to the power supply voltage of the system must be installed and fused according to the relevant regulations.

Approvals

The measuring system is performance-tested in accordance with EN 15267.

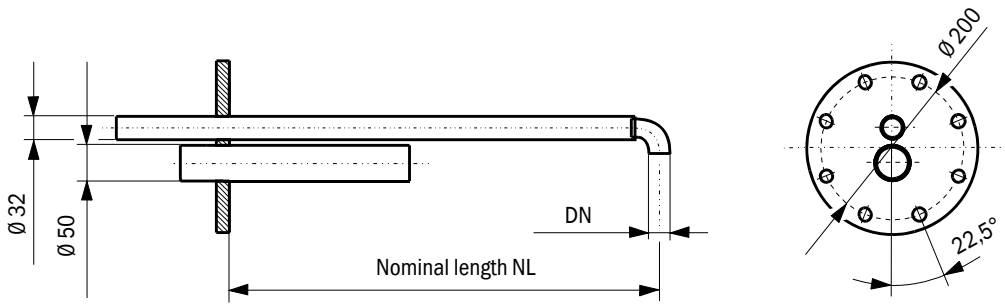
Subject to change without notice

7.2 Dimensions, Part Nos.

All dimensions in mm.

7.2.1 Sample gas probe

Fig 101 Sample gas probe

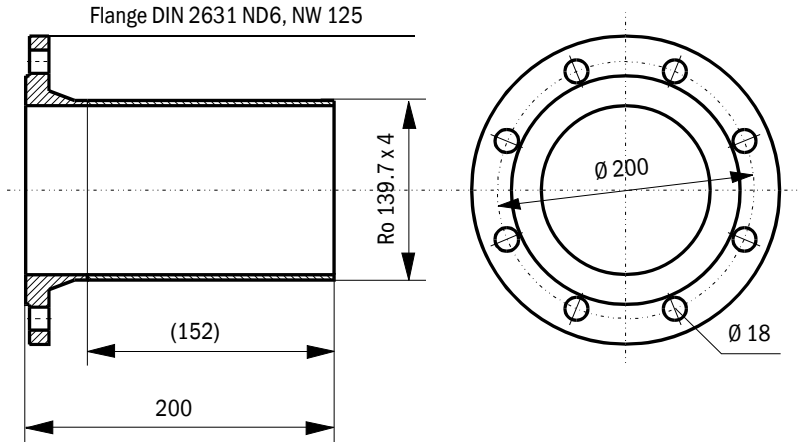


NL = 600, 1200 DN = 14, **18**, 23

Designation	Part No.
Sample gas probe NL 600 PVDF var.	2074811
Sample gas probe NL1200 PVDF var.	2075029
Sample gas probe NL 600 Hastelloy var.	2075038
Sample gas probe NL1200 Hastelloy var.	2075039

7.2.2 Flange with tube

Fig 102 Flange with tube

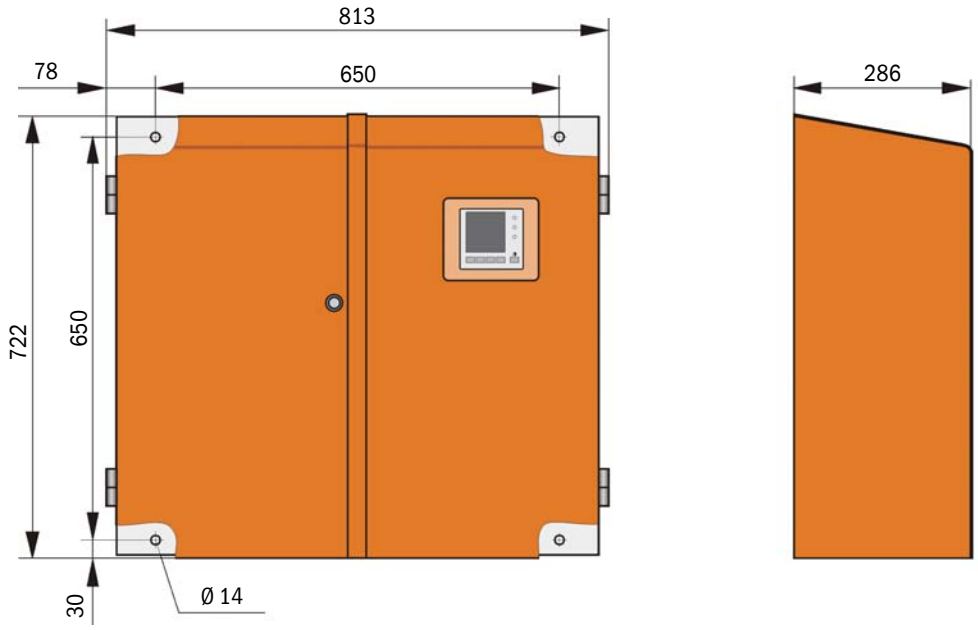


Designation	Material	Part No.
Flange with tube D139ST200	St37	7047616
Flange with tube D139SS200	1.4571	7047641

Subject to change without notice

7.2.3 Measuring and control unit

Fig 103 Measuring and control unit

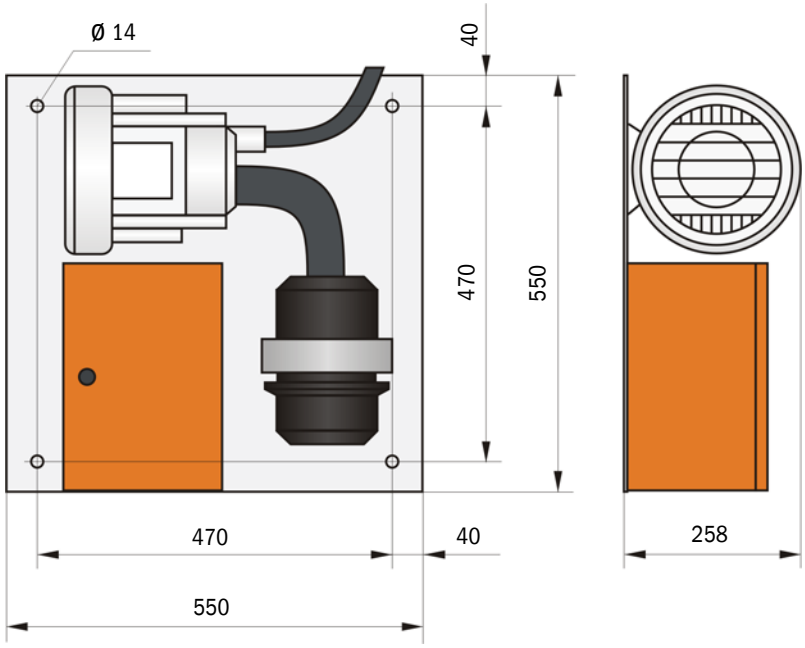


Designation	Part No.
Measuring and control unit FWE200DH-NNJ	1066190
Measuring and control unit FWE200DH-NNE	1068441
Measuring and control unit FWE200DH-NNP	1069950
Measuring and control unit FWE200DH-BNJ	1068461
Measuring and control unit FWE200DH-BNE	1069591
Measuring and control unit FWE200DH-BNP	1069592
Measuring and control unit FWE200DH-NHJ	1069593
Measuring and control unit FWE200DH-NHE	1069594
Measuring and control unit FWE200DH-NHP	1069595
Measuring and control unit FWE200DH-BHJ	1069596
Measuring and control unit FWE200DH-BHE	1069597
Measuring and control unit FWE200DH-BHP	1069598

Subject to change without notice

7.2.4 Blower unit

Fig 104 Blower unit



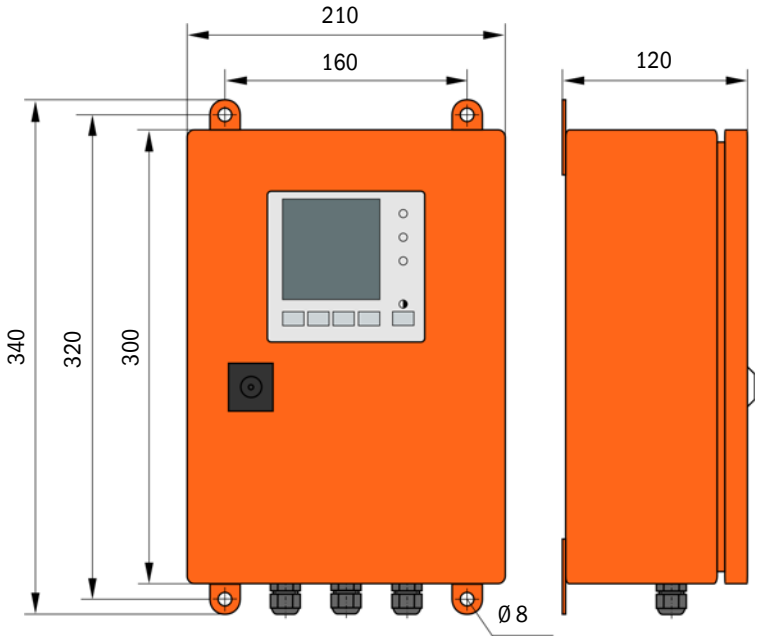
Designation	Part No.
Blower unit with blower 2BH1100, filter, purge air hose length 10 m	1067951

Subject to change without notice

7.3 Options

7.3.1 Remote unit

Fig 105 Remote unit

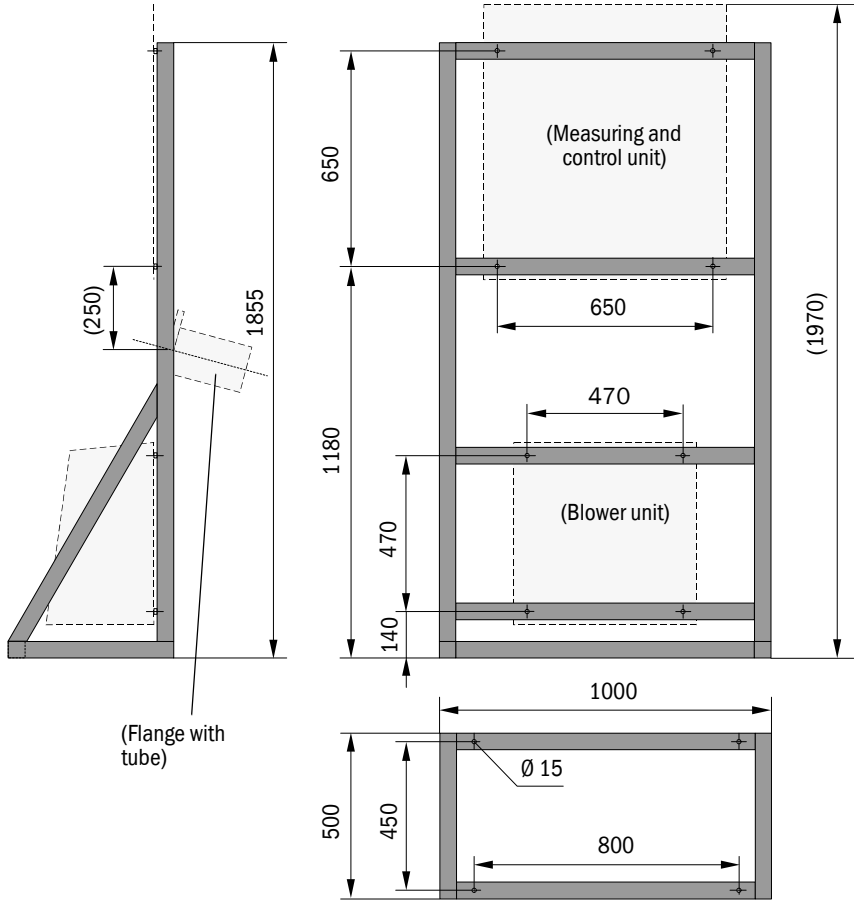


Designation	Part No.
Remote unit	2075567
Remote unit with integrated wide-range power pack	2075568

Subject to change without notice

7.3.2 Frame

Fig 106 Frame

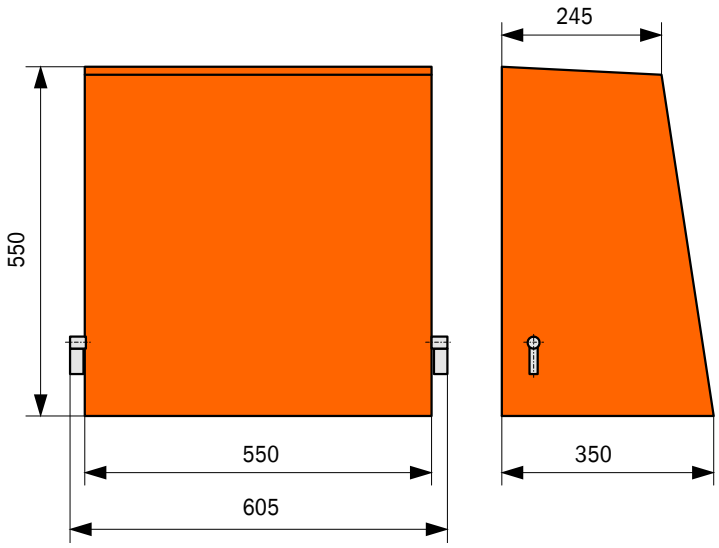


Designation	Part No.
Frame	7047617

Subject to change without notice

7.3.3 Weatherproof cover for blower unit

Fig 107 Weatherproof cover for blower unit



Designation	Part No.
Weatherproof cover for purge air unit	5306108

7.3.4 Measuring system

Designation	Part No.
Backpurge unit option	2073682
Cover at the bottom	2074595
Option, heated extraction hose, length 4 m (3 m heated)	2075575

7.3.5 Interface module

Designation	Part No.
Interface module, Profibus module DP V0	2040961
Interface module, Ethernet type 1	2040965

7.3.6 Device check accessories

Designation	Part No.
Test equipment for linearity test FWE200DH	2072204

Subject to change without notice

7.4 Consumable parts for 2-years operation

7.4.1 Measuring sensor

Designation	Number	Part no.
Optics cloth	4	4003353

7.4.2 Blower unit

Designation	Number	Part no.
Filter element, Europiclon 3000 l/min	4	5306090

Subject to change without notice

FWE200DH

8 Annex

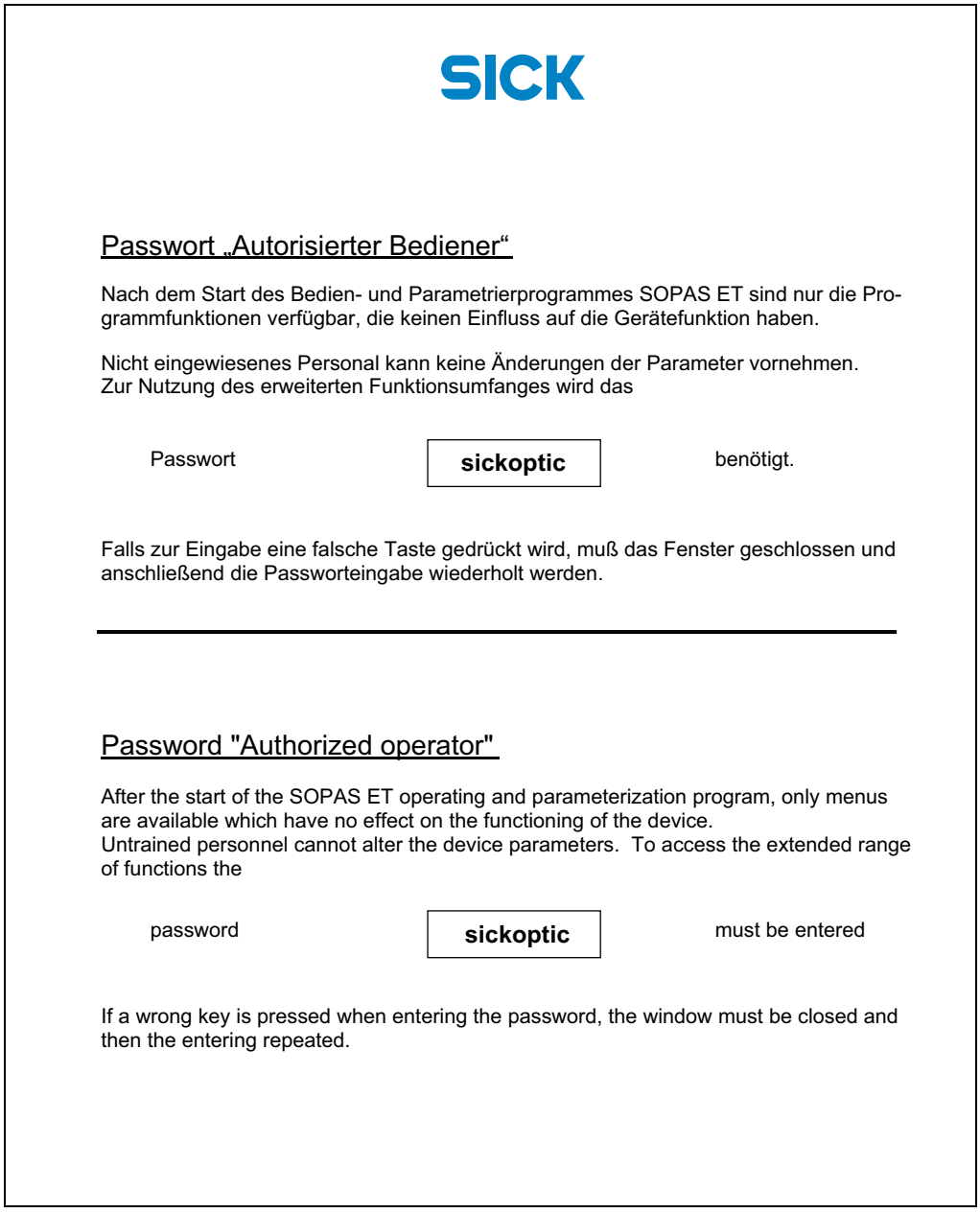
Password

Standard settings FWE200DH

Subject to change without notice

8.1 Password

Fig. 108 Password



The password is part of the system documentation delivered with the measuring system.

Subject to change without notice

8.2 Standard settings FWE200DH

The protocols for parameter settings when delivered (factory settings, → p. 69, §4.3.1) are part of the system documentation delivered with the measuring system and are therefore not described separately in these Operating Instructions.

Subject to change without notice

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